WESTERN AND NORTHERN CANADA WORKSHOP ON

WATER QUALITY OBJECTIVES

Saskatchewan Environment
Water Pollution Control Branch

Environment Canada
Water Quality Branch

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WORKSHOP HELD AT THE UNIVERSITY OF REGINA

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This workshop represents a joint undertaking on the part of both of our agencies. It resulted from the recognition of a need to promote awareness and understanding of the development and use of water quality objectives. To that end, we encourage the reader to review the discussions that are relevant to their particular interests, and if there are further questions, contact either of our agencies.

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EXECUTIVE SUMMARY

WESTERN AND NORTHERN CANADA

WORKSHOP ON WATER QUALITY OBJECTIVES, AUGUST 26, 1985

A Workshop on water quality objectives for western and northern Canada was held at the University of Regina, Saskatchewan on August 26, 1985. The workshop was a joint venture organized by Environment Canada's Water Quality Branch and Saskatchewan Environment. It was a follow-up to a national workshop held in Burlington in 1984. The workshop participants represented a wide cross-section of government agencies and private interests. A list of participants appears at the end of the proceedings. The workshop format consisted of three panel presentations followed by open discussion on the session topics. To avoid any confusion, handouts were provided at the outset of the workshop defining specific terms as they were to be interpreted during discussion. These included the terms objectives, guidelines, criteria and standard.

PANEL 1

The first panel session, on data needs, included overviews, from the provincial perspectives of Saskatchewan and Manitoba, on how objectives are used and their implications for provincial water quality managers. Saskatchewan provincial objectives are multi-purpose tools used for the following purposes: setting effluent standards; comparative purposes with

respect to monitoring data; assessing the suitability of specific surface waters for specific uses and; as a public relations tool. Objectives also play an important role in environmental impact assessment.

In Manitoba uses of objectives are divided into two broad categories; to assist in interpreting water quality monitoring data and as a planning tool in order to avoid contamination. Each of these uses requires specific types of information including the following: scientifically sound criteria for a broad range of individual parameters; water quality monitoring data including physical, chemical and biological parameters; some form of trend analysis to aid in data interpretation; and an administrative process. Although similar information is required for both use categories there are some major differences. For the second use category the information must be rigorously tested and scientifically sound. Also, it must be possible to present the analysis of the above information and defend all decisions at public hearings and to senior management.

Federal concerns relate more to the development of sound objectives and to ensuring that data is available to support these objectives and to modify them as necessary, rather than to the uses of objectives. In this regard, there is a need to determine how objectives are limited and how to gather data, needed by management now and in the long-term, for improving or refining objectives and avoiding confrontations. Towards this end there is a need to identify specific types of information, which would serve as the basis for the initiation of action, e.g. monitoring activities. Data displaying statistically-significant trends is an example of a type of information need.

Since monitoring is essentially a random selection of events, some more extreme and some more representative of average conditions, the monitoring process itself is a probabilistic exercise. It is therefore only appropriate to try and include probabilities in the development of objectives. Using a statistical approach and defining objectives in terms of probability of exceedence makes the defence of objectives much more feasible. The simple use of absolute numbers encourages confrontation and delays management activity.

Discussion included talk about the need for a fairly comprehensive data set, e.g. looking not only at aspects of water quality but related aspects such as land use. Distinction was made between data needs for objectives development versus the maintenance and refinement of objectives. Some controversy exists over the role of monitoring and its value for objective development versus laboratory work. Development of objectives from scratch, for specific sites is generally done through controlled laboratory experiments while existing objectives can be modified through the use of monitoring data.

Monitoring programs should be formulated to fit the water quality objectives that are developed and the role of monitoring should be to provide an answer to the question; are we protecting the environment? A key question related to monitoring is; how much is required to adequately address a specific use? Monitoring is, at best, an imperfect early warning radar.

A set of questions was raised related to site-specific versus universal objectives and the need to consider availability of resources in dealing with these questions. There is a definite need to move away from universal

objectives and apply objectives to specific water bodies or river basins or sites. Other questions were raised regarding the need to determine whether or not the set objectives do, in fact, protect the uses they were intended to protect.

PANEL 2

The second panel session on research needs/priorities included discussion about the relationship between national water quality guidelines and development of site-specific objectives. The Guidelines provide basic scientific information required to assess water quality problems and provide a starting point for the development of objectives. This procedure involves varying degrees of judgement relating to the reliability of the scientific information. Some questions were raised regarding the conditions under which the national guidelines could be adopted or applied to site-specific objectives. The issue of adaptability of previous research done in different regions was brought up. It was felt that there is a definite research need to test the applicability of existing laboratory data and data from other regions for western Canada.

The session focussed on the research required, when adequate data is not available, in order to provide the sufficient minimal information necessary (e.g. when the guidelines cannot be translated into an objective). Determination of an adequate research base is essential and will obviously be related to the availability of resources and a need to make the most of what is available. Before concluding that more field research is needed, more

comprehensive use should be made of the data already available. There is a need to determine the gaps in existing data and then fill these gaps with directed research. The need is for more practically oriented field research, done for specific sites and identified problem areas. When looking at research priorities for development of objectives for specific sites, there are some gross modifying factors that should be considered. These can be grouped into physical, chemical and biological factors. The need for more co-ordination of available information and research was also discussed along with the issue of formal and informal mechanisms for co-ordination of research and for communication to researchers of specific research needs. Feelings were expressed that a greater commitment was needed towards the interpretation of data, not just to the generation of numbers. Setting objectives is a cyclic or iterative process. The growing data, derived from monitoring, is part of a total data base needed to develop new objectives. New research needs are indicated at all stages of the process and every stage provides data for the next. At some point research needs become data needs when we understand enough about them to specifically identify what else we want to know.

A number of regional water quality issues were addressed. These included concern over present levels exceeding guidelines, new chemicals (e.g. agricultural chemicals) entering the environment at a rate faster than guidelines can be prepared, and a lack of existing guidelines due to a lack of relevant research. There was also concern expressed that there is an unwillingness at times to accept guidelines in spite of the research done. As well, comments were made regarding the difficulties involved in developing

practical objectives when concentrations of substances fluctuate greatly. A further point related to a possible lack of protection of biota by the guidelines due to the inappropriateness of the sampling medium.

More specific research needs that were identified, pertained to organic chemical pathways. These pathways were grouped into three general classifications including transport and accumulation in biota. With respect to transport, there is a need for an understanding of the factors that control how things move and at what pace, and to relate this to the hydrograph. With regard to the accumulation in biota, although the simplistic approach would be laboratory analysis, it was felt that a better approach would be to determine bio-concentration factors at specific sites of interest. Of importance is bio-concentration versus bio-accumulation of contaminants since the differences are dramatic. Degradation mechanisms were identified including photochemical degradation, hydrolysis and biodegradation. Research interests related to photochemical degradation include sunlight quantum yields and the determination of photochemical half-lives. Half-lives of chemicals under real conditions is also a research need related to hydrolysis. Biodegradation rates are very difficult to determine. The actual pathway of the degradation is an important aspect. Volitization of organic contaminants, especially from streams, was also identified as a pressing research need. Determining the rates at which things happen was felt to be the direction research should be pointed in.

PANEL 3

The third panel discussion focussed on opportunities for co-operation on both formal and informal levels. The strengths and advantages of various interagency projects were discussed, most of them being successful, positive experiences, beneficial to all the participating agencies. Some of the ingredients of these projects which helped to make them productive include; a willingness by each of the participants to be involved without expecting to achieve 100 per cent of their agency goal, the opportunity for each participant to have meaningful input into a project and, sensitive handling of controversial issues such as public relations. Elements which do not contribute to a positive experience include; the sensationalization of information and reports, failure to follow through on agreed to action or complete the processes begun and, back room manipulation that does not involve all the parties. In order to take full advantage of the limited resources that are available, co-operative effort among agencies is essential.

A definite need for improving interagency co-operation, co-ordination and communication was discussed. The process should be an iterative one, with ongoing consultation to ensure that progress remains on track. The role and value of co-operative agreements were discussed in terms of providing opportunity and direction and in setting the framework for co-operation. The Federal Government is trying to negotiate water quality monitoring agreements with the provinces in an attempt to develop comprehensive plans for water quality assessments in Canada. These plans indicate the need for three basic data bases. The first is a long-term data set. The second, which has not really been developed yet, is a data base for water quality objectives, either

for the development of these objectives or the verification and validation of them. The third type of data base needed is for environmental impact or state of the environment. Techniques do exist but lag behind due to resource problems.

Further discussion followed on data bases versus the availability of data. It was felt that the long-term data set, provided by routine monitoring programs, is reasonably accessible. There was some conflicting opinions regarding the accessibility of more fundamental scientific research and the need to facilitate access to it as well as remain informed so as to help direct it. Related issues include the need for data quality assurance programs and improved data exchange mechanisms to make the data readily accessible in a timely fashion to all participants.

Concern was expressed regarding the need for more co-ordination between the collection of data and its interpretation and dissemination. There is a lag between data gathering and its interpretation which must be eliminated. Presently, our laboratory capacities far exceed our abilities to understand and interpret data. Methods to be used for data analysis and comparing data should be developed simultaneously with objectives in order to reduce this problem. Joint interpretation of data is also important rather than individual agency interpretation of data to meet only its own needs. It was felt that, in order to ensure its use, data had to be provided in more usable forms. There are a variety of users with specific needs, which we should try to accommodate. We are failing to interpret data for the general public or even to reduce data for other scientists.

A distinct hinderance to co-operation is the lack of clearly defined federal and provincial roles. Mechanisms are available to improve co-ordination and enhance information sharing. Trust among agencies is essential for improving co-operation and co-ordination of projects. Political boundaries must be separated from scientific boundaries through co-operation. The Saint John River Basin was discussed as an example of successful multi-agency co-operation. All participating agencies have a direct interest in the interjurisdictional waters and therefore participate willingly. The experience demonstrates what can be done when individuals are committed to a specific task of concern to their agency.

A few final comments related to the type of forum considered to be most appropriate for further advancement of the topics discussed during the workshop, such as the advantages of small working groups versus larger groups or committees.

DR. THOMSON: Good Morning, I would like to start off by asking Mr. Bob Halliday, the Regional Director of Inland Waters Directorate, Western and Northern Region to say a few words.

MR. HALLIDAY: It is my pleasure to welcome you to this workshop. I would particularly like to welcome those of you who came from outside of the Western and Northern Region.

We had originally started this workshop as a regional workshop, but it has grown quite admirably over the last several months. It is a real pleasure to see quite a cross-section of people here.

The workshop has been a joint Water Quality Branch Saskatchewan Environment idea. Don Fast, Director of the Water Pollution Control Branch of Saskatchewan Environment was one of the instigators and will be here later on to ay as a panelist.

The workshop, is one way of showing the Inland Waters Directorate commitment to water quality objectives. This commitment started back in the 70's when we got involved in guidelines publications, and through our participation in various IJC boards on the Red River and the Poplar River. More recently, IWD has allocated a number of person years to the objectives program, and we finally became fully staffed in this region in the last few months.

Much of this Division's work, more recently, has been devoted to the CCREM initiatives relating to water quality objectives. At the moment,

the CCREM material is almost finished, at least the first phase of it, and we are looking forward to seeing some of the products of that exercise.

Our regional group is also involved in the promotion and development, maintenance and evaluation of water quality objectives, and it's to that end that I look forward to activities in the future that will lead to a greater understanding of what we mean by objectives and make sure we are all working on a common basis.

A large proportion of our effort is devoted to information exchange, and I hope that this workshop is just one step in fostering that information exchange, and I wish you well with it.

DR. THOMSON: Thanks very much, Bob. My name is Ken Thomson. Bob Ruggles, of Saskatchewan Environment, and myself have talked about this through the winter, and this is the culmination of our talks.

This workshop is a follow-up to a national workshop that we had last year in Burlington which was organized by Dr. Margaret Taylor of the Water Quality Branch headquarters group.

We are going to have three panel discussions. Panelists will each talk for about five minutes, no longer than five minutes. There will be 15 to 20 minutes of discussion among the panel, and then it will be open to the floor.

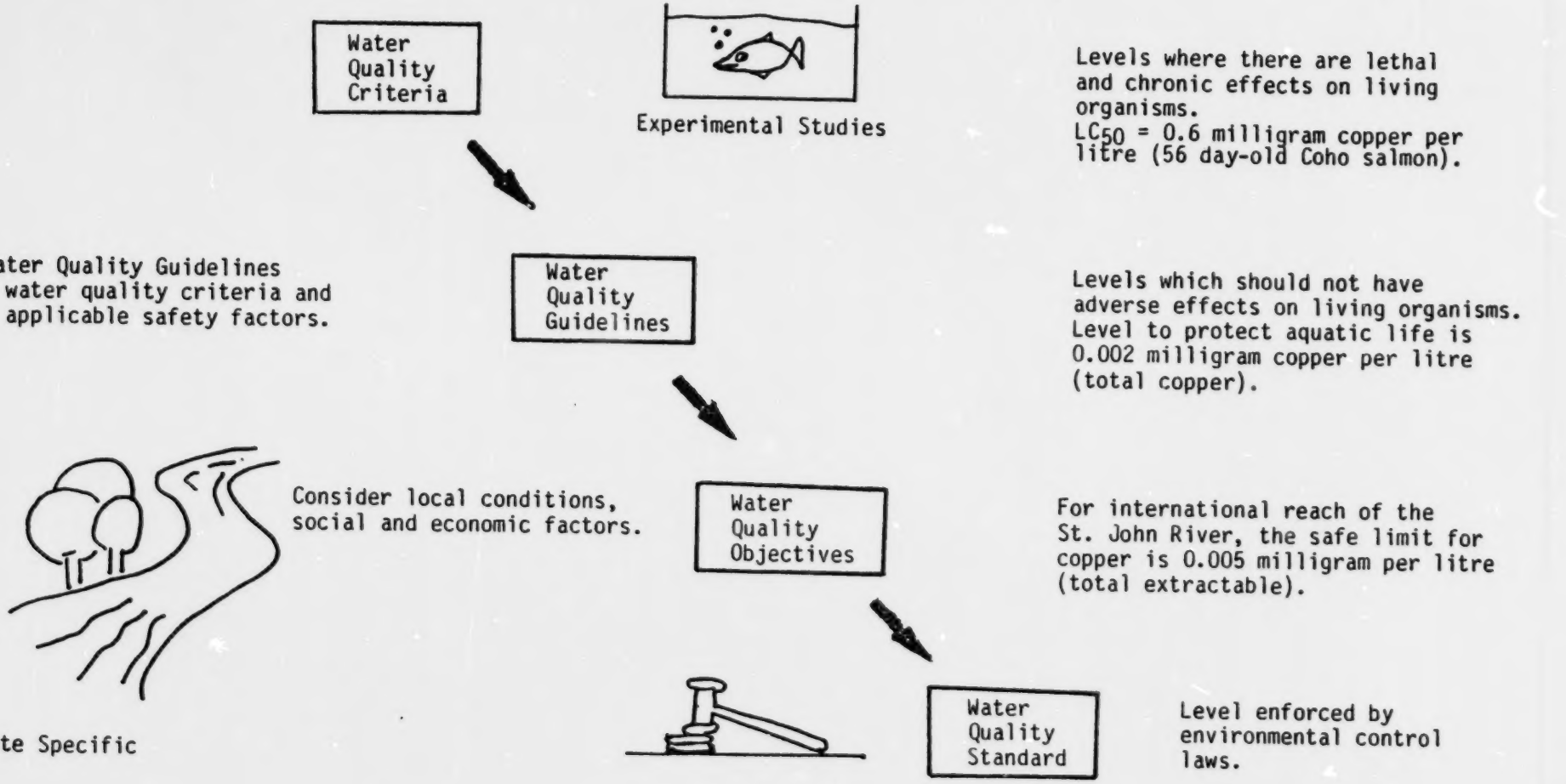
Please do not hesitate to participate from the audience. Basically, everyone in this room has some involvement with regard to water quality objectives in the west. Everybody has at least talked about it. Everybody has done some work in that area.

But basically, we are not very advanced in terms of getting things going. We do not have any set specific criteria in the west. We do not have any situation where criteria have been adapted to guidelines or to objectives. We are starting to and we shouldn't be afraid to, ask the very fundamental questions. And really, the reason that I am here today, and the reason I have been so interested in working on organizing this workshop is to learn.

The other item of business I want to cover is to tell you what we are talking about today in terms of definitions. I don't want the proceedings to get into a long argument about what is an objective, what is a guideline, what are criteria. So for purposes of today, I am going to define them, and then when you leave the room you can call them whatever you want.

You all have received in your handouts, this diagram that is taken from a preliminary working document of the CCREM exercise on guidelines (Figure 1). We have a sort of a hierarchy in terms of definitions that we will be dealing with today. We have water quality criteria, which are the basic building blocks for objectives, most usually based on scientific

Figure 1: Relationship Between Water Quality Criteria, Guidelines, Objectives and Standards


Water Quality Criteria
Experimental Studies
Levels where there are lethal and chronic effects on living organisms.
LC_{50} = 0.6 milligram copper per litre (56 day-old Coho salmon).
Water Quality Guidelines = water quality criteria and applicable safety factors.
Water Quality Guidelines
Levels which should not have adverse effects on living organisms. Level to protect aquatic life is 0.002 milligram copper per litre (total copper).
Consider local conditions, social and economic factors.
Water Quality Objectives
For international reach of the St. John River, the safe limit for copper is 0.005 milligram per litre (total extractable).
Site Specific
Water Quality Standard
Level enforced by environmental control laws.

information, most usually toxic information . . . a specific value, for example, where the natural functioning of a species may become impaired.

Water quality guidelines is the next step on the hierarchy, and there may be an applicable safety factor attached there. They may be derived from supporting literature, supporting documentation, the best scientific judgement. They are more stringent than the criteria level.

Then we have the word that has sort of come to symbolize the whole continuum of water quality management, water quality objectives. They not only consider the preceding, the criteria and the guidelines, but they take into account social and economic factors, and they are part of a negotiated or a consultative process.

In Water Quality Branch of Environment Canada, we; at least myself and my colleagues from Regina office who are here today, would like to say that we "develop" water quality objectives. We don't set them. It is up to the provinces, up to the managers to set them. I would like, today, to talk about the development of objectives, if we could.

And finally, we have water quality standards, much more rare in Canada than in the States, except at the provincial level, and they're, for purposes of today's discussion, simply objectives with legal clout.

Now, I would like to get down to business and introduce the first panel, if they could come up and join me here.

Starting from my immediate left is Mr. Bob Ruggles, who as I pointed out before, is the co-organizer of this event. He is with Saskatchewan Environment and is the Supervisor of the Water Quality Assessment Section. Bob has been with a number of different organizations, including the federal Environmental Protection Service and Ontario Hydro.

Next to Bob is Dwight Williamson. Dwight is from the Manitoba Department of Environment, Safety and Workplace Health. I believe, it would be safe in saying that Dwight has done probably the most work, in terms of water quality objectives in Western and Northern Region. He is very knowledgeable with the sort of limitations that we have with respect to water quality objectives, and the sort of problems we have to overcome, and I am very pleased that he is here today.

Finally, we have my colleague, Dr. Hague Vaughan. Hague, as I am, is with the Water Quality Branch here in Regina. He's the Head of the Monitoring and Agreements Division and has a strong interest in the types of monitoring and the types of data that are needed for objectives. Bob?

MR. RUGGLES: What I would like to do in my five minutes is just give you an outline from a provincial perspective of how we use objectives, and what they mean to us as water quality managers, and from my point in Saskatchewan.

This is a little booklet called Water Quality Objectives that we use in

Saskatchewan. It's a blue book just like they have in Ontario. I think most provinces have them.

These objectives were developed in the early '70's, and they really haven't changed much since that time. They are multipurpose. They are intended to protect a variety of uses, and they are also universal. They apply throughout the province. They were developed in conjunction with Alberta and Manitoba, mainly because we share major interprovincial rivers. They cover about 40 different parameters and make some general statements about taste and odour and pesticides, and so on.

How do we use these objectives in Saskatchewan? We have a regular water quality monitoring network in the province here consisting of about 20 stations, and the first thing we do is compare the data that the lab gives us with these numbers.

Another important use is the setting of effluent standards. For any effluent discharging to any surface waters in the province, these objectives will influence how we allocate those receiving waters in terms of receiving waste, whether it is to allow for fish passage or to allow for a downstream use, such as another water intake or a park.

They play an important role in environmental impact assessment. They give developers and their consultants a list of constraints that they have to contend with up front when they are looking at new developments,

and when they are looking at alternatives when it comes to discharging to surface waters.

We also use them to assess the suitability of a particular surface water for a particular use. That use could be water supplies, contact recreation, noncontact recreation, fish and wildlife, you name it.

And last, but not least, they are a very useful public relations tool for the Water Pollution Control Branch of Saskatchewan Environment. We get calls all the time out of the blue, what's the water like? Does it meet the objectives? And it is nice to have a little book like this to grab in a hurry. It is particularly useful when the media call.

There are two very important assumptions underlying these objectives. One is that they are good numbers, that they are based on the best scientific information available, and the most up-to-date research. In the case of our objectives, they are based on research that dates back to the 50's and 60's, and it is for that reason that we are watching with great interest the CCREM Water Quality Guidelines exercise. We hope that the guidelines that, that exercise produces are going to help us in revising these objectives.

The second assumption is that they do, in fact, protect specific uses. That may be a rather bold assumption. Anyway, this is what we have and that's how they came about and that's what we use them for.

I would like to pose two questions in terms of data. First, how do we know that these objectives do, in fact, protect the uses they are supposed to protect? It's one thing to collect and analyse samples and compare the results to the number that is in the book.

Is just looking at chemical analyses of water, sediments, or fish enough? Is that going to tell us that aquatic ecosystems are healthy, that they are protected? Maybe if we want to protect aquatic life, we should be monitoring aquatic life. How else do we know that these objectives are working?

If a water quality objective is supposed to prevent bio-accumulation of a certain contaminant in fish so that anybody eating the fish is going to be protected, maybe we should be monitoring that contaminant in the fish instead of in the water or in the sediments.

In Saskatchewan, we do monitor fish for things like mercury, but maybe we could also use those same fish to monitor trace organics or pesticides. Another example, there has been a lot of research lately looking at contaminant loading in suspended sediments in some of the prairie rivers and in some of our reservoirs. That is all very interesting to know if a certain contaminant or a certain extract from a sediment in the Saskatchewan River kills nematodes or fails the Aimes test, but what does that tell us about effects on water users?

The only other point I would like to make in my allotted time is the business of site specific versus universal objectives.

I don't think it is fair for us in Saskatchewan to apply the same total phosphorous criteria to Reindeer Lake in the north, or Wollaston Lake in the north, to the Fishing Lakes here in the south. I don't think it is fair to apply the total phosphorous criteria to the North Saskatchewan River in the same way we would apply it to the Wascana Creek which runs through the city here.

It is easy to say that, but we don't have any data to say different, and I don't think we, in Saskatchewan at this time, can make any move towards a site specific or river specific criteria. It would require a horrendous amount of resources that we are not even close to obtaining right now.

DR. THOMSON: Dwight.

MR. WILLIAMSON: Thank you. I will speak to many of the same things that Bob has, except from Manitoba's perspective.

We, in Manitoba have been formally using water quality objectives since 1976. The uses to which we put objectives can be divided into two broad categories; these broad categories will probably overlap with the several that Bob discussed with reference to Saskatchewan.

Firstly, in Manitoba, we use objectives to assist in interpreting water quality monitoring data - data generated either from routine water quality monitoring networks or from special, rather intensive site specific water quality studies.

I will briefly talk about the types of information that we require in order to use objectives for this purpose.

Initially, we require scientifically sound criteria for a broad range of individual parameters. For this use, we can also include some very general objective statements about environmental quality. For example, we can include statements such as "free from substances that injure, are toxic to, or adversely affect water quality use". It is a very broad statement, but as a tool to interpret monitoring data, it is useful.

We can also be rather innovative, (although I think at this point in Manitoba, this is largely theoretical, but nevertheless we are approaching it). For example, we can include objectives for toxic responses or objectives that can be stated in terms of certain allowable variations in aquatic organism populations. We can also include statements pertaining to maximum allowable tissue levels in aquatic organisms. (Bob spoke to this with regard to mercury in fish muscle tissue).

As well, we could include statements that would limit toxic organic

concentrations in the tissue of terrestrial organisms that may feed on aquatic life. Further, we could also include rather broad objectives in other related aquatic media, such as suspended solids or bottom sediment.

Following this, we of course require water quality monitoring data, including chemical, physical and biological parameters. We must be able to relate exceedences of these objectives to certain processes that may be going on within that stream or lake. In the case of a stream, we must be able to relate exceedences to a hydrograph, if possible.

Following collection of this information, it, of course, must be interpreted. Here it is useful to have some type of trend analyses that would tell us whether or not we have a problem at present, or whether or not we are likely to see a problem in the near future. After a problem or a potential problem has been identified, an administrative process then is initiated in order to determine if remedial action is required.

During this administrative process, we require answers to many questions. First of all, what is the cause of the objective exceedence? What is the use that is or may be jeopardized in the future? What is the value of that use? Are control strategies available to treat the cause? Is the cause point-source, diffuse source, perhaps natural? What is the cost of the control technology? Does the cost bear any relationship to the value of the use? Finally, what proportion of the problem might be solved through point-source treatment as opposed to that remaining, that proportion that perhaps is natural or less easily treated?

These are very difficult questions to answer in most cases, but nevertheless, answers are required by senior management and politicians before they will react to a certain problem.

Secondly, in Manitoba, we use objectives to assist in placing restrictions on liquid effluent discharges, whether such discharges originate from industries or municipalities. I emphasize that this is the most important use of objectives in Manitoba. These water quality objectives, therefore, are used as a planning tool in order that we can avoid contamination. We can be most effective as an environmental management agency by pursuing this use of water quality objectives.

Most of the water quality based information required for this use is similar to the information required for interpreting water quality monitoring data, but there are some major differences.

Firstly, the information must be rigorously tested and must be scientifically sound. The consequences of an error are rather great. Should underprotection occur, contamination may result and may require a very expensive cleanup operation. Overprotection may result with unnecessarily high cost being directed towards industry or municipalities to provide a level of treatment that may not be necessary.

Once scientifically sound criteria, usually for single water chemical parameters, are obtained, We then, if necessary and if possible, adapt

those criteria to protect the most sensitive use within a stream or within a lake or watershed or a region. In Manitoba, we have called this process our watershed classification process. In order to use objectives successfully for this purpose, we must be able to predict through some type of modelling exercise, dynamic or steady state, the maximum amount of a specified constituent that should be allowed to be discharged, in order not to exceed a certain objective. For this type of modelling exercise, we, of course, require historical stream flow data and historical water quality data. Hopefully, we could enhance this data base with more information from site specific intensive studies. We must also make a prediction of the various substances and their respective concentrations that might be present in the effluent of concern, in order that we could know which parameters to control.

Other information may be required in order to answer questions like: Can the objective be modified to take into account certain site specific conditions such as the ameliorating effect of, for example, hardness, temperature or conductivity? Has the criterion been developed using certain aquatic species that perhaps are not present at that site? What proportion of the stream should be allotted for a mixing zone? Will there be an adequate zone of passage left for the movement of fish both upstream and downstream? Have the effects from upstream and downstream industrial and municipal discharges and other land use activities been considered?

Finally, we must be able to present the analyses of the above information and defend all decisions at public hearings and to senior management.

Thank you, Ken.

DR. VAUGHAN: Fair enough. It is only fair to point out from the beginning, I suppose, that these two represent the users of objectives, and I as part of the federal government, am more concerned with development of sound objectives and ensuring that the data is available to support them and to modify them as necessary.

So, in a way, part of my responsibility is to try and predict how objectives are limited, and how to gather data now that might be useful in improving them or refining them. So I sort of play devil's advocate here.

I can see, for example, a need to parallel the development of objectives by means of criteria with a complementary approach. That is, examining the question "what does management require in order to initiate some water quality planning action"? In that perception, criteria-based objectives are confrontational.

We have spoken of the way in which a new industry might have its effluent controlled. We have spoken of how a given water body may or may not be good for a prescribed use, on the basis of the specific criteria that we have developed, or the specific objective for a particular parameter.

From an interjurisdictional point of view, one can use objectives to identify a significant event that may cause a certain amount of upset or demands for action from downstream users. But these are all confrontational situations, and I am more concerned with what kind of information could I provide to the water managers that would initiate action by which those confrontations would be avoided.

In that sense, I see a need for the identification of specific types of information such as statistically significant trends, or something along these lines, which provincial management would accept as the basis for the initiation of some sort of action.

The development and use of objectives should reflect the fact that we test very little of the water, usually a small sample twelve times per year. Demands for action, based on the concentration of a substance within one such sample are inevitably controversial. Further with concentrations, almost anything is possible, as a natural occurrence. But if we can agree to use our objectives based on a statistical point of 95 percent nonprobability that this level will exist, then that is a kind of information need that I can deal with in terms of monitoring activities.

Similarly, I can deal with concentration of a substance that is largely controlled by flow, and therefore, on the basis of a flow/concentration relationship in a stream of known flow variability predict what is a

statistically safe level. That is a level that I can deal with as a monitoring agent, but the simple use of an absolute number to me encourages confrontation, and delays management activity until such a time as it is almost too late.

We have an awful lot of problems, as has been mentioned here with toxics. They form a kind of special case, and I expect over the day, we are going to be addressing whether toxic levels in biota or sediments can form a sound basis for objectives.

As you know, we can't monitor for many of the toxics that are actively used. We are a number of years behind. I wouldn't care to guess what percentage of the hopper spray which has been used this summer. We actually could detect in water, even if it was there in relatively high concentrations.

We also have a problem of breakdown products and synergistic effects. So it's very much to our benefit to be able to use toxic screening tools, and if objectives can be developed from these that are acceptable to management, then that would be an important bit of information to know at this particular point. Dwight has indicated that it is within the realm of possibility for the provinces to set and use objectives as they see fit and, as a result of these considerations, I would be interested in hearing more about the provincial views.

Lastly, I think we ought to say right from the beginning that the objectives we are developing are ball-park figures. If objectives are presented as scientifically valid absolute numbers, then we are going to have to live with them, for better or for worse. That perhaps might not be so important in terms of an awful lot of uses such as drinking water or industry, but in a region as large as I have to deal with including northern waters, it is extremely important with regards to the protection of aquatic life. We have no real idea whether an objective developed in southern waters is at all applicable to northern waters, if your goal is the protection of aquatic life.

In order to find out, we will have to be able to assess the overall health of the aquatic system and relate this to known levels and patterns of aquatic chemistry. Further, in order to defend the results, we will have to relate this to system characteristics with which the public can identify.

As a result, we will need an awful lot of research which we can use to quantify different kinds of monitoring tools, such as toxic screening, or concentrations in biota. For example, if we look at species in which the public is interested (e.g., salmon, sports fish), over a whole series of different environmental circumstances, say in northern waters, then we can attempt to calibrate such a tool. This would allow us to see levels or trends developing at much lower levels than might be jeopardizing or observably affecting those particular species.

From my point of view, then, I can identify a data need right now which will be involved in the refinement and the testing of many of these objectives. That is to describe exposures, their variation, the nature of events versus averages, etc., particularly for toxics. This sort of thing will be a definite need in the future, as we take the objectives that are developed through the criteria process and attempt to apply them to water of varying characteristics, particularly when the concern is the protection of aquatic life.

In general, then, what I am looking for here today, is to find out management needs, what would cause actions, whether the avoidance or confrontation is possible through variations of the objective processes now pursued, and what you see in the long term as needs that you are going to have to see filled in terms of data availability, in order to pursue this whole question of refinement of objectives.

DR. THOMSON: I suspect that these gentlemen have raised a number of provocative points or ideas. I would like them to discuss a few of them among themselves first, to raise a few more ideas.

And I will start off by asking you a quick question, Hague. In summary, are you essentially saying, that there is a difference between data acquisition for the development of objectives and data acquisition for the maintenance of objectives?

DR. VAUGHAN: Very much so. I think we can acquire certain types of data, as we have through routine monthly monitoring, describing background conditions. These can be related to objectives or use, even protection of aquatic life within certain areas, in a number of ways, some of which I've described. But ultimately, we are going to need somewhat different types of data in order to refine these objectives in a site specific or regional specific manner. I think that they are going to have to be refined in order to be used in the most proper way, and they must be publicly defensible, which perhaps is a point I didn't emphasize sufficiently.

If we develop objectives for protection of aquatic life in the north, and we base those on a toxic screening tool or benthic diversity, then we are going to have to be constantly aware of the need to relate this to a use with which the public can identify, such as sport fish, and we must design our data acquisition to do so.

DR. THOMSON: You have hit upon one more point. The word defensible or valid. This is my great problem with the types of exercises we get into at the federal level of producing guidelines or whatever. I remember from when I used to work for a provincial government, once something got on paper, it was pretty hard to deny the fact of that number's existence. You have to live with that number. And so there has to be a lot of careful preparation of that number in the first place, and I guess that's the biggest cautionary point that I keep in my mind as we work

ahead on these CCREM guidelines. That whatever they are meant for, whether they are meant for government, whether they are meant for industry, or whatever, people are going to use those guidelines and say why didn't you use that number in those guidelines?

MR. RUGGLES: I will just echo what Ken said in terms of numbers. In the public domain, this is a very well known document, and I suspect that the CCREM document will also become very well known and highly quoted and often referred to by not only people in the water management business, but by the public at large. They are not to be taken lightly.

And just as an aside, I think with the CCREM exercise, although very worthwhile, we have to be very careful that the numbers generated there are in fact good numbers. And from a provincial point of view, we are not given much opportunity to have much input into those numbers. It is a very fast process from my perspective.

I would like to just ask Hague one question about statistically determining trends and using statistics and probability in determining water quality objectives. I wasn't sure what you were getting at there. We, right now, have a single number objective, and if it is exceeded, it triggers action. And I am wondering what you were getting at?

DR. VAUGHAN: What I am getting at is that water quality, particularly when you are dealing with any individual parameter, is a pretty random

process. It is quite possible under certain conditions of flow or temperature or biological processes to obtain just about any reasonable number that you could name for any specific parameter. Further, when we monitor, we do it monthly so every single sample is an event and some are a little more extreme than others, just as some are a little more representative of average conditions.

Therefore, if water quality information on a specific parameter has or can be defined as, almost a normal distribution, then instead of saying we should manage water quality so that this number is never exceeded, what you want to do is manage it in such a way that, that number is unlikely to occur at a given level of probability.

Basically, you want to reduce the probability on a simple normal curve to let's say 95 per cent by water quality management practices according to the mean and variance. That's the kind of objective that best suits the kind of monitoring that we do.

MR. WILLIAMSON: I think the objectives can still be stated in a rather concrete and absolute fashion. It all depends on what administrative process you might go through after an exceedence is detected. That is, during this administrative process, the data would be rigorously examined to determine the significance of the exceedence; frequency of exceedence would be one aspect that would be examined.

I think one of the criteria that you mentioned in your presentation, Hague, was that these objectives must be understandable and accepted by the public. I am somewhat concerned that they might become just a bit too complicated. It is inherent in the use that we make of objectives, that we, as water quality managers take these things into account. They may not necessarily have to be stated up front.

DR. VAUGHAN: But I don't see the two as being mutually exclusive. If we take oxygen and say oxygen shall never be observed lower than five milligrams per liter, well with the amount of water we test out of the average river, that could be down below five milligrams per liter every single day and probably not detected. But, if you are taking management action to maintain oxygen at certain levels, with a certain degree of variance, so that it is 95 percent unlikely that oxygen is ever, within the whole population of events, (of which we sample 12 a year) below five milligrams per liter, then that is a very realistic objective in terms of the kind of monitoring that we do.

In order to defend objectives, such as the way they are being approached here, I would have to set up something such as what we do on the Red River. That is a 100 percent perfect data base, water sampled every 15 minutes. That's a very expensive process. We can do it, but it takes an awful lot of resources.

But this gets back to my idea that we don't really monitor all of the

water. We monitor very select, and in terms of the way water quality varies essentially a random selection of, events. And so, in that monitoring itself is a probablistic exercise, it is only appropriate to try and include probabilities in objectives.

At the other end of the spectrum, good water quality management should be initiated when trends are observed, rather than when those trends reach a level where some sort of danger or impairment is possible. Statistically, we can demonstrate a significant trend, and by that trend predict that so many years down the line, it will approach a level designated as being dangerous.

If that is an acceptable approach, then we can start initiating action at a much earlier stage than we could if we base objectives entirely on individual numbers.

So it is just a different point of view, because I am in charge of monitoring this stuff. It is a very limited routine activity, and it is a statistical one, and this is something one must appreciate right from the beginning.

MR. WILLIAMSON: I certainly agree with you. I am not disagreeing that exceedences of an objective is a random process.

Water chemistry in total, has to be taken into account. I am not

disagreeing with the interepretation of exceedences. I am just saying that perhaps we can still state objectives as absolute values, but these things are taken into account, for example, auxiliary reports.

DR. VAUGHAN: Fair enough, but if I get back to my point: what initiates management action? Confrontation or sound water quality management based on probability, things to avoid.

As Ken was saying, we are going to be stuck with these numbers because they are going to come up in books, and they are going to be there and everybody is going to use them. Right from the beginning, it has been said that solid absolute numbers for each and every parameter is what we need. And as long as we don't detect those solid absolute numbers in 12 bottles of water a year, everything is fine.

Well that's not adequate. It may be for a lot of particular uses you can identify, but it certainly isn't for protection of aquatic life, and it certainly isn't a valid approach according to how aquatic systems work.

MR. MCKERNAN: Isn't there an analogy in microbiology, in terms of perceptions of the microbial population and some judgement as to potential risks? Our very sampling protocols demand a probablistic approach. It is all carefully worked out. I agree completely with what you are saying, and would argue that the fact that one generic category of perceptions of quality (e.g. microbiological) is based on a

probablistic approach suggests that we think about moving probability into other monitoring aspects, as well.

DR. VAUGHAN: Well I am glad you agree

MR. MCKERNAN: Well I am a private sector representative; in our work for clients, frequently we have to deal with this problem. There is a number. Somebody says it has meaning. Here is an observation, one event that suggests we have a problem. Somebody has to make a judgement about the response to this one observation and the whole perception of the frequency of occurrence is the obvious question that is begged. If you have no data to respond to this question, everybody is in a dilemma, so I would support the argument for the soundness of the database any number of times.

MR. BECKETT: I should preface and say that my biases are for the biological perspective, not the chemical. From listening to this, it seems that the setting of specific objectives, as concentrations in water, doesn't really work for us anymore. I think it is okay to have objectives like that for specific maximums where you can definitively say, you never want this more than that in any situation.

And this goes back to what Dwight Williamson suggested, which strikes me as the logical way to go, setting objectives of overall quality. We would have absolute maximums for these materials, but in addition, we

want these qualities of the environment such as no fish kills, or no observable affects in the population. I don't think that it is that impossible to set requirements like that where they're not specific numbers. They're not saying it will be exactly this, but saying that the changes we are willing to accept are such.

Then you can go in and say, look, biological populations have changed or diminished, you can say that is an absolute. Even in the terms of public relations, I think that is a very acceptable thing to present to the public. If you tell the public oxygen levels are such, or cadmium levels are such, they don't know what that means. I think if you could say: this is a quality of the river that's decreased, we have determined that it is a bad sign, and that is what we are monitoring.

DR. VAUGHAN: I would agree totally. The problem with a lot of them, and we could call these screening tools if you want, is that they will have to be weighed by the public against something like restriction of local development. They are used quite extensively in Europe. There are toxic treatment centres where the criteria for effluent water is whether a guppy can live in it for 24 hours. That is a lovely criteria. Everyone can identify with it.

In terms of ambient water quality, it has to be something that is a little more than a yes or no type of question. Can a guppy live in it for 24 hours is a very publically identifiable criteria, but from our point of view, we want to identify where an emerging problem exists.

So we need something that essentially goes on a curve. Now, you will likely be seeing the use of things like bacterial respiration of a particular bacterial group, or nematodes, whether they grow, whether they reproduce, and I think there is an awful lot of opportunity to try and develop these as tests of where water quality is inadequate but if you are going to try to use these to develop or refine objectives, then you are going to have to have something that is publically identifiable related to these nematodes or bacteria.

The other factor is the sheer expense of monitoring for toxic chemicals. The standard high quality sample that we take at interjurisdictional sites is analyzed for just about every toxic organic compound that the lab tells us they can do, and it costs well over $1,000 a sample. Even then, there is an awful lot of pesticides and herbicides being used that we can't monitor for. Further, when we do detect the presence of such a compound, we cannot be sure of what it means. We know it's not good but we can't at this point relate low concentrations to possible effects.

So I think your approach is far better, and I think that is what we are going to see. If the province is telling us that this is a justifiable basis for management decisions, that's good news, because then we can proceed in that kind of way.

Do you agree, basically, with that?

MR. WILLIAMSON: I agree.

I also point out, though, that we are talking only about using objectives as a monitoring tool; it is only going to help us to interpret monitoring data, to determine whether or not there is likely to be a problem in the future, or whether we have a problem now.

But we, as water quality managers, are still most effective by using objectives in order to avoid future contamination. It is only practical, at present, to use objectives, for this purpose, for single parameters, stated in absolute terms. Afterwards, we are still faced with the problem of did we limit the right material or was the effluent standard low enough to avoid use impairment.

So, we still have to monitor to make sure that we made a correct decision. But I emphasize that relatively complex objectives are only useful as a monitoring tool at present, because we don't have the modelling techniques to translate a very complex objective to something that can be enforced legally at the end of a discharge pipe.

MR. RUGGLES: I am a little concerned about what Art Beckett said concerning biological monitoring.

I agree, it can tell us a lot, but when you talk about variability and simple chemical parameters, when you start monitoring fish populations or

investigating invertebrates or whatever, I think you are stuck with an even bigger problem in variability, and we are not even close to that, and certainly not in Saskatchewan.

And when it comes time to setting effluent standards, we, as water managers, would have a pretty tough time, I think, stating one of the rules for you to discharge is not to change the benthic diversity index by more than 10 per cent. I think it would be very hard for us to work with objectives like that. I think that's why we kind of favour, at least at this point in time, chemical parameters.

MR. BECKETT: My orientation towards that actually isn't the benthic type of work, as much as it is the biological screening test. A fairly wide range of different screening tests, that you can apply fairly quickly, instead of the detailed type of population survey that Bob is suggesting. The value I see in that, is that they take a lot of different factors and put them all together in one response, and you can take it anywhere from acute down to chronic, mutagenic, carcinogenic or whatever, and it will be one response.

The problem, the ongoing problem is, defining an acceptable level of mutangenicity. I think it has been demonstrated in Europe, in Japan, and even now in the States, that it is possible to get an agreed upon gamut of tests that you can use, if not point out violations, but the trends. I think the latter is probably more of a problem than obvious passes and

fails which can still be handled in a lot of situations by analytical chemistry.

Where people are having the problems is that no single thing really seems to be a problem, but on the other hand, we have no guarantee that there aren't problems occurring over the long term. I think that's where the biological tests can fit in, and in some situations replace analytical chemistry; they will take an integrated response.

DR. THOMSON: Does anybody want to add to that?

DR. BELLIVEAU: Not add to what was said right there, something that was said by the panelists.

There were two statements made by the panelists, which I hope they were slip of the tongue. I am not sure.

One of them, and I don't know who made it was, that you should develop objectives so that one can interpret the monitoring data, which seems to indicate that the water quality objectives are subservient to the monitoring itself.

The other one was to develop objectives so that it fits the type of monitoring program existing. It seems to me we have the tail wagging the dog here because the monitoring program should fit the water quality objectives that are developed, rather than the other way around.

The other thing too, I hope we remember that water quality objectives, (i.e., the management tool), is not a goal by itself. I have worked on a number of committees that developed water quality objectives, and we had two requirements before we started in each case. One of them was that the parameter we were developing objectives for had to be measurable, and the other one was that the parameter had been to be controllable. In other words, you had to have some anthropogenic activity. It is no use trying to set objectives for a parameter that exceeds any limit you put on, but it exceeds for natural reasons.

The other thing is, in most cases, we try not to set a number without a lot of conditions attached to that number. One, we specify the analytical method that will be used to find out if that number has been met or not. We also specify the monitoring plan or monitoring program that should be used in order to gather the data that will be compared to that specific objective, and also the method of comparison that will be used. Are we going to compare means? Are we going to compare median values?

Another thing that we have been doing is making sure that we state what the impact will be, if the objective is not met. For example, if you exceed this particular parameter by a certain level, you can expect this to happen to the use.

Finally, in order to overcome some of the problems that have been stated

before, we try to put down a specific review period. In other words, these objectives will be in existence for the next three years, at which time they will be reviewed, and the latest scientific information will be brought in, and they will be updated. I think by doing that, you are not going to get stuck with the number that you are going to have to live with for the next 25 years.

DR. THOMSON: Dwight, I think that you can address the last part; the review period, in respect to Manitoba's response in that regard.

MR. WILLIAMSON: In that regard, we have just recently put an administrative process together that would enable the objectives to be under continuous review. This process will allow us to incorporate revisions for individual objectives as new information becomes available. This process is less formal, hence more easily accomplished than a review followed a specified time frame. So I think that is even better than an absolute time frame, such as three years.

DR. BELLIVEAU: Well, in the case I was referring to, we have a constant review. We have a mandatory review period of all parameters after a particular constant review frame and the latest information coming up. That forces it to be done, so you just don't forget about it.

MR. WILLIAMSON: I was one of the guilty parties that you referred to by mentioning earlier that objectives could be developed as a monitoring

tool. That wasn't a slip of the tongue. It's only through describing an innovative objective, incorporating that objective within certain monitoring programs, then accumulating a data base that we will be able to apply that rather complex, innovative objective to specific parameters that may be controllable. Right now, for things like toxic indices, or as I mentioned, certain variations in population composition, can't be related to controllable substances. I think it would be useful to have such things as objectives, with the understanding that they would only be used to assist in interpreting monitoring data. We can use such monitoring objectives to determine whether the things that we did control are working.

DR. BELLIVEAU: Yes, I think the difference is, you're speaking in terms of having province-wide objectives, whereas I am speaking in terms of objectives that are set for a particular basin, in our particular area within a basin. So we wouldn't be setting them, unless they were measurable and controllable in the first place, whereas in your case, if you are doing it on a province wide basis, you would have to hit every parameter, or a number of parameters, and develop a certain number of objectives for it.

DR. THOMSON: I don't know if that's specifically true.

MR. WILLIAMSON: No, I don't think our situations are different. We also start out with objectives that we think would be applicable to the entire

province. We also have a process that allows us to refine those province-wide objectives to fit individual streams, individual lakes, or individual watersheds.

But I still maintain that we can use certain complex objectives for monitoring tools, and we can have other very specific objectives that are suitable for assisting in controlling effluent discharges prior to contamination of the environment occurring.

I would like to throw out something else for debate which I heard mentioned on the panel today, and which I have heard in discussions with colleagues in other parts of the country. There seems to be considerable discussion about using monitoring programs to develop objectives. I am rather confused by this approach. In my opinion, the objectives development should basically take place in a laboratory, only because the effects that we are trying to protect against are very, very difficult to observe in an uncontrolled natural system.

Perhaps someone could respond to how the types of monitoring that we do, can be used to develop objectives? I think monitoring can be used, perhaps, to refine objectives, but not to develop objectives.

DR. HAFFNER: I would like to turn the question around, back to Dwight, and what I would like to know pertains to Bob Ruggles question. He talked of various assumptions on using water quality objectives, and one of the assumptions was, 'do they protect uses'? 'Do they really work'?

I noticed in your talk, you spoke of overprotection. I can't really think of an example right now where there has been overprotection by any agency. I can think of lots of examples on the opposite side of the scale.

I think what monitoring provides is the answer to the question 'are we protecting the environment'?

If you look at Ken Thomson's guidelines that he set out at the start of the presentation, he also didn't use the word 'monitoring'. Criteria are based on such things as LC 50's. What do LC 50's do? They basically test chemicals not environments. They are not designed for environmental protection nor are they designed for ecological problems. They are basically the response of an organism to a specific experimental condition.

After such experiments, you must apply a safety factor. Well that's a little ambiguous if you don't have any monitoring data. Right now the safety factors are a matter of 10, 100, 1,000. It is basically flying by the seat of your pants. It depends on where you are, and what kind of public compromise you have to make to permit the entry of these chemicals into the environment.

And I think that's where monitoring comes in, and I think that is the hardest part of developing of objectives. What are the safety factors?

Obviously there are things out there in the environment that can regulate the effect and exposure of these chemicals. Whether it is sediments, the alkalinity etc. of the waters you are trying to protect, and that's where monitoring fits in. I think this is what's missing in Ken Thomson's diagram.

To refer back to Hague Vaughan's comment on probability. What's the probability of exceedence? How does it relate to your safety factor, to your guidelines? And that's where monitoring fits in. And I think what we tend to be missing out in our conversations around this table are akin Paul Belliveau's comments about review, consistent review. Most reviews, that I know of, show that present water quality objectives are in pretty poor shape.

Take for example the Great Lakes water quality objectives, which were specifically designed for the Great Lakes situation. We know they don't work. We know if you take those objectives, or the chemicals we set specific objectives for, and put them to some sort test, nothing lives. There is no protection of the environment, just numbers for regulatory purposes.

I don't know what this consistent review is. It is a word we always talk about. Maybe Paul can answer what is a "review"? And how does it relate back to Bob Ruggle's question, do objectives really protect uses?

There seems to be something really wrong here. What are we reviewing? Are we reviewing what objectives are for or are we reviewing them according to some sort of correct procedure?

DR. BELLIVEAU: In our particular case, the review is done to find out if the level we have set for that particular parameter is really protecting the use we are trying to protect. So we are talking about a number of things.

An example of the first point could be copper. Is there any information on copper that came up in the last three or four years, which could get us to change the value that we have set for copper? Number 2, looking at all the data we have collected over the past three or four years, is there anything in there that seems to indicate the objective, which has been established or developed, is correct.

Let's say we had two or three fish kills on the river during the past three years, and studies have shown that it was caused by a particular parameter. But the concentration of that parameter had always met the objectives in the past three years. Obviously there is something wrong. We have to go back and rework the value for that particular parameter. That's the type of review that we are talking about.

DR. THOMSON: Dwight, could you explain or compare Manitoba's review process?

MR. WILLIAMSON: Well it's basically the same thing. We review our objectives to determine whether or not there is more recent and better scientific information on which to base that objective.

If I may refer back to my earlier comment. I can think of no instance where a specific discharge, that we have known about, has caused fish kills. But we can go back 5 or 10 or 15 years later, and we can see that one species or a number of species have slowly disappeared. This may occur perhaps because we don't have the severe pollution problems in Manitoba that other jurisdictions experience. I am not sure how this could be tied in with this review process.

These are still effects, chronic effects, that we are unable to see in a natural situation. Acute toxic responses can be observed in the field but our objectives must be much lower in order to provide protection against ever chronic effects. I guess in Manitoba we are somewhere between the two. We don't have outright fish kills as a result of effluent discharges, but in the case of some of the northern mining industries, we have seen the slow disappearance of certain species within an entire lake or parts of lakes. It is these chronic effects that monitoring programs cannot detect until after severe damage has occurred.

MR. FREDEEN: When you talk about protecting users, the possibility that overprotection can also create problems, and I just wonder sometimes whether and how often users are represented in the board rooms, or in the

office where decisions are made, or in the interdepartmental committee meetings? It is a question, I guess, that is difficult to answer, but I can think of one instance where there is seemingly overprotection. It is causing users problems. It is the protection of an aquatic environment. The overprotection of water quality can result in problems for the people in the terrestrial environment, and I feel that in this instance, at least, users or the people in the terrestrial environment, at least, should be involved in the board room decisions.

DR. THOMSON: Could you be a little more specific in that example?

MR. FREDEEN: I am talking about the black fly control program in Saskatchewan, where limitation of the use of methoxychlor, which is the only chemical available to control black fly larvae, (a very limited use), may be even more curtailed in the future.

In past years there was a 30-minute to a 60-minute use of methoxychlor in each entire year. The minute concentrations used has had no effect on fish that is recognizable, almost no effect on the benthic organisms, yet, if methoxykchlor isn't used, the farmers, the livestock producers, and the urban dwellers in east central Saskatchewan will suffer.

In terms of dollars and cents, in 1978, it is calculated there were nearly three million dollars in losses to the livestock owners alone. And yet, there is a constant threat that the methoxychlor use will be cut off, even though its use is limited.

Now I believe that the environmental people who are setting the guidelines, really have never experienced black fly outbreaks in east central Saskatchewan. They seem to be unwilling to recognize the fact that there is a terrestrial problem out there that is environmental, coupled with the aquatic environmental problem. I am just suggesting that the residents of this region should be involved in helping to make decisions about the aquatic environment.

MR. RUGGLES: I think your point is well taken. And I guess the only point I would like to make is that Agriculture Canada, in their wisdom in administering the Pest Control Products Act, registered products like methoxychlor, based on the best information they have, and they have an interdepartmental committee which looks into things like methoxychlor, the problems with it, the effects it has, and they make decisions on the registration.

From a provincial point of view, we don't have the resources to be able to do that kind of research and to put that kind of effort into looking at a pesticide, and so we depend very heavily on the federal, interdepartmental committee and the advice they give Agriculture Canada.

It is a dilemma we are in. We have to accept, because we don't have the resources to look at these things ourselves.

MR. FREDEEN: I was really aiming this at the federal environment people who originally set the regulations.

DR. THOMSON: I think your point is an excellent point, that in developing water quality objectives, we should take into account just a little more than the water column itself, or we have to take into view a more comprehensive perspective of the situation.

MR. HALLIDAY: I just wanted to leave you with one idea. Although I am certainly not heavily involved in water quality management, I am involved in management per se, and the problem as a manager that you often encounter is you have to make a decision and run with something, not in one year when your expert says he will have the best answer available, but tomorrow. Quite often, all you can do is go to somebody whose judgement you have come to trust over a period of time and say, what do you think about this, he will give you a number, and you run with that.

So I would like, in your objective setting exercises, to at least have you be fairly honest with your management as to where the uncertainties lie and where the difficulties lie, so that you don't hang them out to dry with a certain number on a certain date.

MR. GODWIN: I would like to ask both Bob Ruggles and Dwight Williamson, a further question. After you have this number, after you have an exceedence or excursion. What do you do, administratively, when that objective is exceeded? Do you take hard action, soft action, or any action?

MR. WILLIAMSON: Well I think I touched on this, Bruce, in my opening statement.

An exceedence does trigger a series of administrative processes. We must first provide answers to many questions. For example, how serious is the exceedence? What is the use that might be affected? How is it going to be affected? What is the cause of the exceedence? Is it an upstream industry? Is it a land use practice? If it is an industry, and depending on what parameter it is, are there control technologies for that parameter?

Our senior politicians also want to know the value of that resource that is being protected. They want to know if there are indeed control strategies available. What's the cost of remedial action. These costs will certainly be reflected back on to the taxpayer.

It is not a simple straightforward administrative process. Usually after a considerable period of time, a decision is reached. It may be decided to take remedial action or to accept a use that is slightly jeopardized.

MR. GODWIN: If the number had a different name, and it was called a standard, would you still go through the same procedures?

MR. WILLIAMSON: Yes in Manitoba, we would go through the same process. In Manitoba we think that calling a water quality objective a standard is

rather meaningless. We have no need to call them standards and enforce them as legally binding standards in the stream after a discharge has occurred. This is because we use our water quality objectives principally to assist in developing discharge restrictions. The discharge restrictions are legally binding.

MR. RUGGLES: Just a couple of things we might do. If it's a number generated by our regular monitoring program, and we find it exceeds the objective, I guess our first reaction is to look at data collected previously. Is this really unusual?

We have situations in Saskatchewan where certain objectives are exceeded regularly, and we know that, and that's been looked at, and so it doesn't bother us, and maybe this gets into the probability thing that Hague Vaughan was discussing.

I guess if you are thinking of a pollution concern, we have such an excellent spill response system in the province here that most of the action is triggered through that system. Either be it from an upstream province or from an industry or municipality, we tend to react more from that point of view.

In some cases, I see objective exceedence as a concern. It may trigger us to conduct some fairly intensive field study to determine the source of the problem and rectify it. So there is a number of things, a number of types of action that we would take.

MR. DUNN: I would like Bob to expound on one statement that he said, if an objective was exceeded a number of times before, there is little concern. Is that because of the fact that the objectives may be slightly outdated, or what do you base that response on?

MR. RUGGLES: Well they may not be appropriate, if you go back to this business of objectives being universal versus river specific or site specific. A good example is phosphorous. It is pretty tough for us to get excited when phosphorous levels in the Qu'Appelle River exceed .05 parts per million. And we know that, that is probably an unreasonable objective for that particular river system. If the copper levels or cadmium levels or something did exceed the objective, then we probably would get excited.

DR. THOMSON: From a data needs point of view, this morning, we have talked about the need for a fairly comprehensive data set, looked at not only aspects of water quality, but the accompanying aspects, land use, for example.

We need to look at data needs for objectives development, and data need for objectives maintenance. There seems to be some controversy or disagreement over the value of monitoring for objectives development versus laboratory work.

There was some mention of screening tools for maintenance, and the necessity to relate these screening tools to specific uses.

The conversation, so far, has touched on a number of other broader aspects, which I suspect will underlie our conversation all day, with regards to the philosphy surrounding water quality objectives and their overall utility.

When we come back from coffee, I would like to keep the conversation going and try and focus on some of these points that have gone on before in terms of data needs.

(Workshop adjourned at 10:10 a.m.)
(Workshop reconvened at 10:25 a.m.)

DR. THOMSON: It was brought to my attention during the break that we have been guilty of using jargon here that some people don't understand. I am refering to the acronym CCREM Canadian Counsel of Resource Environment Ministers. The CCREM exercise that people are referring to, pertains to the preparation of water quality guidelines, the Canadian Water Quality Guidelines that are being undertaken as a result of a decision in the fall, 1983 meeting, of the Resource and Environment Ministers; it was largely Alberta's initiative that this exercise has been undertaken.

Water Quality Branch of Environment Canada has been, under the auspices of this decision, conducting the coordination of the guidelines, and they're scheduled, hopefully, for final presentation at next fall's meeting.

DR. PIERCE: Bob Ruggles, you mentioned that there was a problem in looking at site specific versus universal objectives, or at least regional objectives, and you mentioned that it was obviously a problem of resources. If you are looking at regional or universal objectives, how applicable will those objectives be, as opposed to site specific or river specific objectives?

MR. RUGGLES: Yes, there is no doubt in my mind that we have to move away from universal objectives and apply them to specific water bodies or specific river basins or specific sites. I do know that we don't have the resources in the province to do that right now. There is just no way.

So we, manage with the existing objectives we have to suit different situations. I gave the example of phosphorous. It doesn't work all over the province. We have to take that into account. We certainly would like to move towards river specific objectives, but I don't see that happening in the foreseeable future.

DR. PIERCE: I think that ties in also with the idea of monitoring. Maybe one of the key questions should be, how much monitoring is required to adequately address a specific use? Should we be setting up some type of protocol to look at both objective setting and monitoring, along the lines of some kind of broad scale rapid type of assessment that would hopefully identify a problem area. Once that problem area has been identified, then setting up the type of structure to look at the problem in a more intense aspect?

MR. RUGGLES: We have tended to take that approach in Saskatchewan, to a certain extent. We have selected certain water bodies for intensive study.

Two examples that come to mind, first is Lake Diefenbaker where there is a concern with nutrient loading, mainly. The lake is the major water supply for at least half the population of this province, and there are definite eutrophication concerns there. There have been objectives suggested for that lake, in terms of nutrient loading, and hopefully this intensive study will help us as managers decide whether those objectives will, in fact, protect the lake as a water supply.

Another example, we have just initiated an intensive study of the Saskatchewan River system from the confluence of the north and south branches down to the Manitoba border. And we are looking at a number of things, ranging from the creation of new reservoir, to specific effluent discharges, to water quality crossing into Manitoba, and the implications of setting site specific water quality requirements at the Manitoba border through the Prairie Provinces Water Board.

So that study is looking at a lot of things, but we are not sure what all the issues are on that river. We have some historical data, but there are enough concerns to make us go in and do an intensive study. The two main concerns were the creation of a reservoir and what that would do to water use below the reservoir, and the other concern was what would

happen in the reservoir itself. Potentially, it could be a very important recreational resource in Saskatchewan.

At the same time, there are a lot of discharges coming into the system upstream which may prevent it from being a good recreational resource. What I am trying to say is, we are doing intensive site specific work, and that data will, no doubt, influence the setting of objectives, at least for some parameters.

DR. THOMSON: Does this question address your point, Dwight, about being baffled about the role of monitoring in the development of objectives?

MR. WILLIAMSON: Yes, to a certain extent. In Manitoba, we also, incorporate a system of monitoring based on fixed stations to identify problems and, trends in time, and we have also used a system of intensive studies to further describe a problem. But we have not been able to use the information from these monitoring programs to develop objectives. We can sometimes modify objectives slightly using this data.

DR. PIERCE: Perhaps it's a question of semantics, and I am not too sure what is meant by developing objectives as opposed to modifying objectives in a specific site.

How can you develop objectives through site intensive modification? You can modify objectives. Objectives are based on scientific cause-effect

information with some kind of safety factor involved. You can modify those objectives using certain types of monitoring to answer specific questions on waterbody characteristics or biological availability, but I can't see how you can go the other way, that is take that monitoring data and develop the objectives.

MR. WILLIAMSON: I agree with that fully, and that was one of my earlier questions, that monitoring agencies tend to talk about using their data to develop objectives; I was puzzled by that. Such data could be used to modify objectives, but the basic objective has to be developed elsewhere through other exercises, such as rigorously controlled experimentation.

DR. THOMSON: I think that is an important distinction that you are making. There is a difference between the development of an objective for a specific site from basic scratch versus modification of an existing objective that you got out of a cookbook.

MS. CROSS: When you talk about objectives, you are including social and economic factors, and I think this is where the monitoring comes in. As social and economic factors change, the managers are put in a position where they have to accept certain changes in the water quality. Therefore, your objectives may have to be downgraded to a certain extent because you have weighed the different management considerations. In effect you have said okay, irrigation is a touch more important, and we are going to allow this river to deteriorate to a certain extent, or we

are going to have to set our objectives a little lower because we are taking this into consideration. And this is where monitoring may, in fact, affect or change your objectives.

MR. RUGGLES: Just one comment following up on Ron's question about developing objectives for monitoring data.

The Prairie Provinces Water Board is, in fact, setting objectives, site specific objectives at provincial boundaries out west here, and they are based on long-term monitoring data, and maybe Gary Dunn or Bruce Godwin can comment on those.

MR. DUNN: Yes, the PPWB is taking into account the existing water quality conditions and using those conditions to develop a certain objective at the boundary point that should be met to protect downstream uses in the basin .

The PPWB is developing this indicator, or objective, on the basis of protecting designated downstream uses, not only for, one province, but two provinces downstream. So we have to take into account existing conditions, at a specific point, to develop a level to protect these users, whether it may be one or two provinces downstream.

MR. GODWIN: In developing that, in attempting to set PPWB indicators, we are also taking into account the scientific criteria that says the parameter shall not be above a certain scientific level.

I see objectives essentially as being based on what makes us and/or our environment "sick". We should set these objectives so that scientifically, we will not have anything beyond a level where the person or the environment will be damaged.

Monitoring is a separate entity from objectives, in that it is a search to find out whether the objectives, set to determine the health of the people, and the environment we live in, are being exceeded. The monitoring method we are using now is a random sampling method. Anything you only sample once a month is no more than that. It is an early warning radar, an access device, that we use to determine whether the objectives are going to be reached.

DR. THOMSON: I would say it is an imperfect early warning radar, but it is our best stab at it.

MR. GODWIN: Early warning radar is imperfect, too.

MR. WINDSOR: We (Manitoba Hydro) are one of the water users and managers who attempt to deal with these objectives on a day-to-day basis, both in our operations and in planning for future projects, and quite frankly, the whole concept presents a concerns for our activities.

The topic this morning is data needs. I suggest that for the kind of projects we undertake, there could never be enough data to answer all the

questions that are raised. Because we are the proponent and because of the situations we find ourselves in, any monitoring that we might do, or any data that we might collect, is always questioned as to whether there might be some motive for presenting the numbers the way they are. So we have to depend rather heavily upon both the provincial and federal government agencies as best they are able to provide information.

In Large interbasin transfers of water, for example, or creation of a large reservoir, while they don't add anything to the water or take anything out of it, questions arise with regard to changing water quality due to erosion and sedimentation. The project may or may not change water quality beyond objectives, but certainly, there are changes. Public perception of those changes, rather than fact, becomes the source of questions about the changes.

And quite frankly, in the north, there just isn't enough water quality information, and in many cases we are dealing with almost none. A utility may retain the best expert opinion available to try and make some guesses in terms of project impact assessments, but what actually occurs, may or may not coincide with those expert guesses.

And that leads me to a comment on something that was said this morning, that the presence of individual numbers invariably leads to a confrontation situation, and I would agree with that. An indication of how far that confrontation might go - because of some unique

circumstances, we in Manitoba are faced in a situation where we find ourselves in a very sophisticated legal framework. We are dealing with changes in water quality that don't necessarily exceed the objectives or standards or any other criteria, but because individuals who were affected by the project, perceive that there was a change (which can't statistically or scientifically be proven, or disproves), they have the vehicle to lay claims and cause you to be in a legal format defending yourself on the basis of individual numbers. In this circumstance you put a great deal of reliance on a very small amount of scientific data, and in fact, end up weighing that limited data against opinions of individuals who can make very emotional presentations, and an arbitrator with legal credentials has to make a decision based on those two positions.

So while objectives and standards and working towards them is a very valid concept and a very useful tool, there are implications that can go further than simply trying to determine what the maximum concentration might need to be for a particular variable.

DR. CAREY: I will say off the bat, it will be obvious later that I am a chemist and not a biologist. But I have done a little bit of work on impacts, and I am a little bit confused how you can state an objective based on diversity, (that was mentioned earlier as a possibility). Surely, diversity index and screening tests belong more to monitoring than they do in objectives.

I think one of the strengths of diversity - based objectives is that they are not quite as stochastic as the water sampling, and we don't miss any significant events, but surely that's a weakness too. They also pick up unique events that you can misinterpret six months later. What if you see a change in the diversity index? Do you go upstream to the first potential source and assume it is them?

I think, when you are talking about objectives, you should be talking about things that are controllable, as Dwight mentioned earlier, and you might be able to put a number on, however valid it is, and however difficult to defend it. I can see a tissue level, for instance, as being objective. But I wonder about an effect as being an objective.

MR. WILLIAMSON: I will just add a couple of comments to that.

Yes, I think for the most part, our objectives should be something that are controllable. But I think in Canada, at least, objectives have been used a great deal as a tool to assist in interpreting monitoring data. So if in fact that is the use that we are making of them, let's go a step further and be a bit more creative in the types of objectives that we develop, but develop them only for that purpose. And we can develop them in the same form that we develop the other objectives, those that are controllable.

I see the two things as being separate as you have pointed out, but I see

nothing wrong with calling both objectives; Both types of objectives, if exceedences were detected in monitoring programs, would still just trigger the same administrative process.

Most of our monitoring programs can only detect community composition changes above 20 percent. This is a substantial change within an aquatic system. So once we detect such a change, an administrative process would be triggered which may require more field work to further describe the problem. Perhaps the cause can be traced back to some intervention that can be reversed.

I think if we include innovative objectives like this, we are then more liable to monitor for such objectives. After assembling this data base through our monitoring programs, we may be in a position in the future to be able to use such objectives to control potential adverse water quality influences.

DR. CAREY: I guess we are only talking semantics here. I just think it affects monitoring and is part of the monitoring program. We should become more inventive in the monitoring program, and when we see these things showing up, then maybe that calls for the need for some objectives, or for considering the use of objectives.

MR. McKERNAN: I would just like to speak very briefly to that particular problem.

In attempting retroactively to undertake some statistical analyses about a certain kind of change in a database, we have confronted a statistical problem with the use of ratios as measures of change. A diversity index, by definition, is a ratio. And we are finding, increasingly, that any kind of statistical trend analysis, where you are looking at a ratio of variables, is just fraught with so many problems of interpretation, that first and foremost, statistically, you can't use them.

So in some cases, just as an observation, I suggest that the idea of a "non-event" or "an event we will not tolerate" should, and wherever possible, be related to measurements of just one variable, because any kind of statistically valid interpretation of ratios is just about impossible.

DR. BJONBACK: Since the primary use of water quality objectives is as a planning tool, I would like to get the response of the panel to how they think that water quality objectives would be used to protect water uses into the future, to preserve future options for development. How, in this manner, can water quality objectives, be used as a forward looking, or future-oriented type of tool?

MR. RUGGLES: I guess we look at it from a use point of view. At least, we prefer to look at objectives from a use point of view. And I think as long as that's kept in mind, you can allow for changes in the future. It's happening now in Saskatchewan.

DR. BJONBACK: For example you might want to protect some bodies of water, which are high quality now, for the future, in terms of a raw water supply for municipal purposes. That's one use you could make of water quality objectives.

DR. THOMSON: One of the first steps, theoretically, in developing objectives is the designation of specific uses for that particular water body for which you are developing the objectives. So you're exactly right when you say that you might designate it as a source of potential drinking water. In that case, you would develop objectives accordingly in order to protect that drinking water.

MR. ALLISON: I would like to ask a question of the panel that relates to the definition of an objective in the handout. This definition states that a water quality objective is a level which is "negotiated" to support and protect a designated use of water at a specific site. I would like the panel to explain how you would "negotiate" a level that will protect a use.

As I see it the level that will protect a use is a scientific judgement based on an examination of toxicity and health data. These data usually recommend that maximum acceptable concentrations or other limits not be exceeded to protect a use. As I do not understand how you can "negotiate" scientifically derived criteria I would appreciate clarification of how the words "has been negotiated" contribute to this definition.

DR. THOMSON: The negotiated phase pertains to "objectives" development after criteria and guidelines have been formulated. Negotiation takes into account the social and economic factors of the situation. Criteria, are based on laboratory and or site-specific scientific information. Guidelines take into account the scientific literature that is available. Objectives development considers both criteria and guidelines information as well as the monitoring information for the site under consideration. Then the negotiation takes place for the development of the objective, and maybe further negotiation takes place for the setting of the objective by the managers, by the administrators. It may be a matter of semantics, but I see no problem with that word.

DR. BELLIVEAU: I think the easiest example is, you could establish a number that would protect a particular use, that is if you are talking about one specific parameter, but then we look at the background data and find out that it is two orders of magnitude lower than the level that would protect that particular use. The committee or the group may negotiate to set the objectives at the background level, much more stringent that would be required to protect that use. There's the negotiation. You've got to find out what the level is to protect the use, but you couldn't negotiate it much lower than that. There's the difference between your objective and your criteria.

MR. ALLISON: But that negotiation process established the level that will protect a designated use, or it should. I mean the objective, or

the thrust of this committee, is for your objective is to come up with a level which will protect a use.

DR. BELLIVEAU: Yes, and it may end up being more stringent than that. It will still protect the use, if it is more stringent than the scientific requirement.

DR. NICHOLAICHUK: I would like a reaction from the panel what you consider a level of acceptability for monitoring, to assess changes? Based on experience on the IJC pertaining to Garrison, we were looking for Canadian data and U.S. data. We were really struggling with a lack of adequate data. I was wondering if we have improved ten years later?

MR. RUGGLES: I couldn't give you a number. I really couldn't.

DR. VAUGHAN: Now it would be nice to think we could give you a number on that.

I think the theory is that we take routine samples, and therefore, we can see trends: they will show up as being meaningful. But in reality analytical techniques change so much, our interest in different parameters changes, and these changes often dominate what one might otherwise see in the data base. I suppose most of the theory of monitoring goes back to major ions, but when we deal with toxics most of it falls apart in terms of seeing trends. Since what we see is so affected by what we test for and changes in our ability to detect it.

We often see an intervention, a sudden change in the quality of parameters, which can be ascribed to, say, some new development. But in terms of actually seeing gradual social change or differences in agricultural techniques reflected in water quality as a trend, it is exceedingly difficult, simply because the level of change is often so dominated by the changing analytical techniques.

DR. HAFFNER: Just one point to follow up on that. I think the data we are looking at when assessing changes in the environment, for example the effect of the ban of PCB's and DDT in Canada, are not the best data basis. In my example there weren't many data bases available to assess whether there had been a change in the environment conditions or not, outside of the data base that exists for the Great Lakes which looks at the fish populations and if trends in the levels PCB's and DDT exist.

Outside of this long-term data base, I know of no other data base like that in Canada or in North America, which would tell us that a control, where we ban the use and production of a chemical, has really had an effect, and what kind of time span would have an environmental effect. So I think yes, monitoring is effective. It is, however, a rare occasion where we find a monitoring program that has actually been well designed to do that kind of thing.

DR. THOMSON: This next panel is titled Research Needs. And I have asked three people who have been, or are, or continue to be involved with

research that has application with regard to water quality objectives. I think these three people complement each other quite nicely because they are coming from three different aspects on this.

On my immediate left is Dr. Ron Pierce, who is from the federal, Water Quality Branch headquarters. He has joined us from the Environmental Secretariat at National Research Council. He is currently doing a lot of work with regard to the CCREM guidelines. And we are very happy and honoured to have him aboard with us.

Next to him is Dr. Pat Tones from Saskatchewan Research Council. Pat has done a lot of work in the past with regard to water quality objectives. She has been involved, in the last couple of years, assisting the Prairie Provinces Water Board committee on water quality, and is looking at, I think would be fair to say, practical application of objectives.

To my far left is Dr. John Carey from National Water Research Institute in Burlington, Ontario. John has been doing some work in the west and is, in my opinion, a research scientist who likes to see his research have practical application.

DR. PIERCE: We call this session, research priorities, as opposed to research needs. We would like to talk a little bit about the relationship between the Canadian water quality guidelines that are being developed through CCREM and any site specific objectives that may be developed within regions or within the various provinces.

There are obviously a number of major concerns regarding site specific objectives for this particular region, and Pat Tones will address that.

John Carey will look at the state of chemicals in the water column and what kinds of research should be conducted.

I would like to try and finish off the presentation by looking at some of the gross or overlying modifying factors that will affect the development of site specific objectives.

The Canadian National Water Quality Guidelines hopefully will provide the basic scientific information required to assess water quality problems in an attempt to establish water quality objectives. These guidelines, I must remind you, provide a starting point for the development of water quality objectives. The guidelines which are now being prepared under the auspices of the CCREM, incorporate the scientific data on the effects of pollutants on receptors and attempt to estimate safe levels for specific uses.

This procedure involves varying degrees of judgement, depending on the reliability of the scientific information, and also depending upon the degree of protection that is required for a designated use. So there are two points there. The judgement aspect of the scientific data, and also the degree of protection that you wish to provide.

Guideline information hopefully can be applied or adapted to a specific site where water quality objectives are required to protect or enhance a specific water use.

This morning we talked about what kind of data are required. What we are looking at now, is what kind of research is required when you haven't got the adequate data.

In those cases where objectives cannot be developed from guidelines, what research is necessary to establish the sufficient minimal information necessary? Do we have to conduct full scale research on a specific site? Or can we develop some kind of rationale or some kind of protocol to look at specific pieces of research that we should give priority?

As I mentioned before, there are a number of concerns in this region with respect to specific water quality problems. I would like to turn the floor over to Pat Tones, who will address some of these now.

DR. TONES: The concerns that I am mentioning here are certainly not my own, and they will be familiar to many of you. They are comments I have heard while I have been working in different committees, or working on my present project with the CCREM guidelines.

One of the first concerns occurs when present levels may exceed guidelines. Does a problem really exist? For example, in the

Saskatchewan River system, zinc and copper levels sometimes exceed guidelines. A possible explanation is that the zinc and copper are measured as total zinc and total copper, whereas toxicity information from lab experiments includes only soluble forms of copper and zinc. In fact, you can argue that the zinc and copper in our river system may not be soluble and we may not have a problem. Do we know that? Because we see exceedances quite often, we become complacent. Do we have a problem or do we not? Can we simply ignore exceedances because we have seen them for a while?

The second concern that I have encountered is that the rate of new chemicals that are entering the environment exceeds the rate of guideline preparation. This is certainly true for agricultural chemicals, which are perhaps of greatest concern in the west. Many chemicals will not be in the guidelines relating to aquatic life, because the research information is simply not available. There certainly is a research need at the moment with respect to the agricultural chemicals presently in use on the prairies.

Another question is, do we need specific guidelines? Do we always have to be rushing environmental research so we can assess the latest chemical that has come out? Or is there another way to attack this problem, some kind of general statement that we could use, to avoid being always behind?

The third point is that practical objectives are often difficult to set

when concentrations of the substance fluctuate widely. Suspended solids are a very good example. On many western river systems, suspended solid levels can be very low throughout much of the year, but during high flows they can reach many hundreds of parts per million.

Temperature is another example of a parameter that fluctuates widely. If we have a general statement that says that temperature should not be higher than ambient levels, how would we actually interpret that with respect to seasonal changes? What would be the ambient level? How would we use a general statement?

The fourth concern is that there may be no guidelines because the relevant research is lacking, and the need has not been recognized. Major ions are an example. It's my own personal bias that major ions are a problem which is developing gradually, and which does not concern us at the present. Maybe we should be concerned. Many of the changes in our river system cause major ions to increase: formation of reservoirs, pumping of ground waters, draining of saline lands, and so on. Major ions cause physiological problems only at very high levels but ecological changes may occur at much lower levels. There is very little research on ecological changes due to major ions.

The next point is that, guidelines are not accepted in spite of the research done. That's certainly true for nutrients. There is certainly no shortage of papers on phosphorous, yet many are not that relevant to

the west because our waters are already eutrophic, even hypereutrophic. With the high levels of nutrients that we have, we cannot be sure that our waters are necessarily phosphorous limited. Also many of our major water sources are rivers, yet most of the research, has been done on lakes.

The last point that I am listing is that the water quality guidelines may not protect biota because water is the incorrect sampling medium. A good example is heavy metals and radionuclides coming from our mining industries in the north. Because these substances are largely insoluble in the water, simply setting objectives related to concentrations in the water column, may not, in fact, be protecting the use.

DR. CAREY: I guess I am one of the specialists who gets asked the question and goes away for a few years and comes back with the answer, and by then it is too late, because someone has already come up with the number. One particular emphasis, in this area, is on the pathways of organic chemicals. The research needs that I am going to address will be somewhat more specific than those dealt with so far; they will deal with organic chemical pathways, without intentionally down playing anything on the biological or other areas. The pathways that we are talking about come in three general classifications. The first of these is transport.

At some point, what we are calling right now research needs becomes a data need when we understand enough about it, to specify the types of

things that we are interested in knowing. One of the questions we are trying to answer is the control of organic carbon and sediment on the partitioning of a chemical in a river. The critical parameter for organics appears to be an organic carbon content, rather than surface area. It seems to be possible, in most cases, to develop this parameter a KOC or organic carbon normalized partition co-efficient for a chemical and the research need, at the moment, is to validate this particular approach for a wide variety of ecosystems. But at this time, it has only been validated for places where you have carbon that has been buried for a long time, as in soils and lake sediments. It hasn't been validated in rivers; the only place where we have tried was the Niagara River, and it underestimated partition by at least an order of magnitude.

So, with respect to transport, we have a need for an understanding of the factors that control how things are moving, and what pace they are moving, and there's an urgent need to relate this to the hydrograph. At certain times of the year, you have specific mineral sediments moving and at other times you don't. We don't seem to understand very well the seasonal changes, the types of sediments, and the way that they affect the seasonal partitioning of contaminants.

The source is often important. We know that for PAH's, if they enter the system adsorbed on particles, the desorption kinetics are so slow that essentially they stay absorbed and equilibrium is never reached. So for equilibrium-type parameters such as organic carbon normalized partition co-efficients can't be used to estimate partition.

The second pathway we look at is the accumulation in biota. The simplistic approach is to go to the lab and determine an octanol water partition coefficient. A better approach, in our view, is to determine a bio-concentration factor at the sites you are interested in.

The types of questions you are looking at are whether the contaminant bio-concentrates, just bio-concentrates or bio-accumulates, and the differences are quite dramatic. For instance, chlorophenols and phthalic-esters bio-concentrate in fish, but the organisms appear to be in equilibrium. As a result, whether you measure the water or the organism, you get a consistent answer.

However, some things bio-accumulate in the food chains and the level you measure in the organism at a given time isn't necessarily directly relateable to the level in the water. However, you want to know for the organism and for the contaminant that you are looking at, does it bio-concentrate or bio-accumulate? How available is it in the system? We know, for instance, that in the Hudson Bay lowlands, we have 100 parts per billion for certain PCB's in the surface water of the Moose River and that would imply a very, very high level in the biota. In fact, there are trace levels in the biota and trace levels in the sediment. Certain site specific parameters, (in this case dissolved organic carbon content in the water) are very high. It is controlled by the bio-availability and the levels to which these contaminants accumulate in the organisms, you must get site specific to really understand the specific process.

With organic contaminants, we find the questions are a little bit different than inorganic contaminants because they are not elements and they do degrade. Of the four degradation mechanisms, that we identify, photochemical degredation the first one that I will discuss.

Some of the data we would like to see or research we would like to see conducted involves sunlight quantum yields. These can be done in the laboratory, but they always have to be related back to the natural system - because in any photochemical half-life determination, we have to consider depth and mixing as important parameters, and as a result, you have to consider site specific properties. What system are you talking about? What's the average depth? How well mixed is it? What's the suspended solids content? How far does light penetrate? All of those things have to be answered. What you are really after is a half-life, photochemical half-life, and many, many photochemical sites never get to that stage. In order for it to be relevant in a system, I think that is the parameter we should go for.

Next, we can consider hydrolysis. Hydrolysis can just happen on its own or it can be acid or base-catalyzed. If it is just a simple hydrolysis reaction, it is very easy to calculate a hydrolysis half life (just the rate count divided by the logarithm of 2). For the catalysed hydrolysis have to assume a pH for the system and can do the same thing assuming the pH doesn't change. So once again, once you are considering half lives, and half lives of chemicals under real conditions as opposed to conditions that pertain under the laboratory is a research need.

Biodegradation rate estimates are very difficult to determine because biodegradation is basically a second order rate expression where one of the terms is a concentration of bugs, and that is very difficult to determine. The concentration of bugs that you count, may not be the bugs that are doing the degradation. One important thing to point out is that when you are talking about degradation, you may be talking about a stable population which is just ticking over not growing, but is still doing the degradation, and you can go and count bacterial numbers and see no changes. Degradation and growth are not the same things, and that always needs to be pointed out.

The actual pathway of the degradation is important. Just to give you an idea, we know that for the aerobic degradation of chlorophenyls in small streams, half lives are the in order of hours, four or five hours. For the anaerobic degradation in soils and sediments the half lives are 10 years and 20 years, and they go to different products.

Sometimes these can be really crucial. The anerobic toxic degradation of toxaphenes, for instance, produces products that are more toxic than toxaphene itself. Some very highly chlorinated compounds of 10 to 12 chlorenes are not bio-available and not very soluble. As you anaerobically dehalogenate them, you make them more bio-available and you increase their effects. So those are the important things.

The equilibrium approach says, that at the interface, Henry's law

constants are important, and you can use Henry's law constants to relate volatilization rates of one contaminant to another. But I think we have a poor understanding of the volitization of organic contaminants, especially from streams, and that's also a very pressing research need.

In general, we have two basic approaches. I don't want to dwell on it, but chemists like equilibrium approaches because they are easy to understand. Equilbrium approaches and thermodynamic approaches are all right. They tell you the direction the system is going, but they certainly don't tell you how long it is going to take to get there, and a lot of things can happen in the meantime.

You know, thermodynamically, we shouldn't be here (Carbohydrates shouldn't exist, but should be in the form of carbon dioxide). But we are here, and we can get into all kinds of trouble while we are here. I think that's the point of view we should take. The crucial things are not the thermodynamics, not the equilibrium, but the rates at which things happen, and our research should be pointed in that direction.

Finally, not to leave out effects totally, I have thrown in just one thing that I think is important. It is a research need right now, and a lot of people are working on it, and that is the development of specific tests to look for effects in actual ecosystems. Things like activation of particular enzyme systems by a given class of contaminants, show a lot of promise, a lot more promise than some of the more general biological

schemes we have available right now. I believe that's a research need for the future.

DR. PIERCE: I would like to finish with a brief overview of some of the gross modifying factors you should consider when looking at research priorities when developing water quality objectives for specific sites.

I think we have already shown that we can't simply take a number or a statement, a national guideline, and apply it to a site without looking at some of the data, and also look at the quality of the research required to generate that data.

The guidelines obviously don't always reflect on the bioavailability and/or the toxicity of a specific pollutant in a specific site. Modifying factors, as John Carey has indicated, can very significantly alter the chemical, physical and biological characteristics of a particular pollutant.

The basic modifying factors can be grouped into physical, chemical, or biological. I must mention here that we are looking at aquatic ecosystems as a use, as opposed to other types of use.

With respect to research that has to be conducted in order to set site specific objectives, you obviously must look at the stream characteristics, obviously things like the size, the flow

characteristics, and the chemical makings of ingredients in the water system. You have to pay particular attention to the hydrograph of the system. Some watersheds have high and low flows in different areas and also at different times of the year.

One has to look at the aeration or re-aeration of the water, temperature, and suspended solids. These modifying factors have to be considered in any research program.

One also has to have some basic idea of what the substrata is like, whether it is clay, soil, or bedrock or organic detritus.

One thing a lot of people overlook when they are doing water quality research, is their failure to observe the surrounding environment for example, the riparian characteristics such as the bank cover, stability of the banks, any runoff, seasonality of runoff, and origin of the runoff.

With respect to chemical modifying factors, characteristics such as dissolved oxygen, nutrients, solids, alkalinity, and pH, should be considered. It is incredible, the many researchers and monitoring people who don't always look at these characteristics.

In any attempt to adapt guidelines to site specific objectives, you have to obviously look at biological response. Hence, you have to look at the biological characteristics of the stream.

Some kind of inventory has to be conducted to look at a tolerant versus nontolerant species, and also the health of that system whether it be diversity indices or other measure of ecosystem health.

As a final point, or perhaps as a starting point for some discussion, we could look at a couple of questions where I think we need answers. The first question is, under what conditions can you adapt or apply national water quality guidelines to site specific objectives?

The second, and I suppose more important question is, where you cannot take the guidelines and simply translate them into an objective, what research is necessary to obtain, what I call sufficient minimal information, to establish water quality objectives? The question of resources came up repeatedly this morning, so we have to look at what is the adequate research base we are looking for.

DR. CAREY: There is an additional point that I would like to mention. I think there's a de-emphasis away from identification surveys to find out what's in a water system. I think we may need objectives for, and we certainly should be monitoring for two types of contaminants. You certainly have to watch for and monitor for chemicals that are extensively used. We can often get use-surveys, although they are pretty hard to get, and are quite often considered confidential. But we also should be looking for surprises. We don't do that very well. A lot of our work is very routine. There isn't too much exploratory work. It is

not encouraged by agencies nearly enough as it should be; looking for things that are there and maybe shouldn't be, and relating back to how they got in to the system.

I think there is an historical reason for doing that type of work now. It was done extensively in the Great Lakes in the past, and to some extent I feel that people in other parts of the country have inherited what happens right now in the Great Lakes as an existing program. There certainly appears to be a perception in certain spots that the Great Lakes parameter list is good enough for all of Canada. As a result, you find people looking for mirex and octochlorostyrene in North Saskatchewan River samples and not looking for trifluralin and things that are actually used here. I think that's the real problem here and now. I think we ought to address it.

DR. CARLISLE: I think we have been tending to think of the whole exercise of setting water quality objectives, as a linear process, forgetting that it is really cyclic or iterative.

One example, that could be used is zinc and copper in the Saskatchewan River. Zinc and copper are exceeding the guidelines. Now that should not indicate that we need to use that monitoring data to look at our criteria and develop new guidelines. The whole thing is iterative. We are not just dealing with research at one step in the process but at every step. The growing data base derived from monitoring is part of the

total data base needed to develop new objectives. New research needs are indicated at all stages of the process, not just between the objectives and the monitoring, but at every stage around the cycle. Every stage indicates new research needs, every stage provides data for the next stage along the cycle.

DR. PIERCE: I agree, it is not a linear process, obviously.

I think we have to be cautious with respect to resources. How much information do we really need? How much research do we have to conduct, or how much data do we have to collect to answer specific questions? Then, if we have the luxury of something left over, perhaps we could look at more research.

DR. CARLISLE: I don't think looking at more research is necessarily a luxury because at each stage in the cycle, we must be identifying what are the research needs required for the minimum information.

Using the example of copper and zinc, clearly, we are not addressing the right problem. We are wasting an awful amount of resources if we are looking at total copper and zinc, when we are beginning to realize that our guidelines are quite wrong, that they should be expressed in terms of soluble or available copper and zinc.

So we need research to go back to the criteria, bring in the new

biological evidence to address what is missing, and how do we set about developing new guidelines and objectives, and ultimately, a new monitoring program. By doing so, I think we are almost certainly saving resources, rather than using resources left over as a luxury.

DR. PIERCE: The guidelines are not necessarily wrong.

I was trying to make the point this morning that you cannot simply take a guideline number and directly use that number. You have to consider modifying factors in your example of copper and zinc. I'm not sure whether those modifying factors were ever adequately considered. That's why you have to have a combination of a certain minimal amount of data collection and research, to try and answer more of the questions in a site specific aspect.

DR. TONES: I think there is a high level of cooperation needed to complete another loop, if you like. It usually would fall to the provinces to set a site specific objective or a river specific objective, and yet I think provinces seldom have the technical staff to do that, especially for organics or pesticides. There simply can't be a specialist in every area on every provincial staff. The research institutions have to cooperate by first telling the provinces what compounds may be of concern. I don't think it can always be left to the provinces to initiate a request for more research. I think it has to be a cooperative effort, a workshop type of situation where there is dialogue. I think that may be missing some of the time.

DR. CAREY: I'm not sure. While I agree with the perception about it being an ongoing process that requires modification, I'm not sure that that's a widely held view. It creates a great deal of frustration among the agencies who have to go and attempt to use that even before the ink is dry on it.

MR. WILLIAMSON: I have two questions, one for Dr. Pierce and one for Dr. Tones. However, they don't relate to the present discourse.

Dr. Pierce, you had mentioned that in the exercise that you are now participating in, the CCREM guidelines development, that one of the judgements that's required is the degree of protection that is necessary. Degree of protection seems to be a policy statement that perhaps should be negotiated. Therefore, that would more properly fit into the definition of an objective, rather than a guideline. Do you have a preconceived number, for example, for the protection of aquatic life, that has already been applied, i.e. degree of protection?

DR. PIERCE: Essentially, I believe that the negotiation stage is appropriate during the development of objectives.

The guidelines are based on scientific information. The designated use to be protected will also be included in the guidelines, with some degree of safety.

MR. WILLIAMSON: But there has been no judgement inserted into the guideline development process other than those that are already built into, for example, the USEPA criteria.

DR. PIERCE: The judgement I am referring to is based on the quality and appropriateness of the scientific information.

DR. BELLIVEAU: Plus the safety.

DR. PIERCE: Plus the safety factor.

MR. WILLIAMSON: The degree of protection is not quite the same as applying a safety factor to make up for the inadequacies of a scientific data base. I think you have correctly pointed out that there are two steps, but I am just trying to find out whether or not you had gone further from making a judgement on the scientific soundness of the information then applying an appropriate safety factor, or whether you had, in fact, made a judgement as to the degree of protection.

DR. PIERCE: No, the judgement applies to the quality of the data base.

MR. WILLIAMSON: Thank you.

The second question is for Dr. Tones. You had asked a question regarding whether or not we require objectives or guidelines for individual, for

example, pesticides that presently are being widely used and that we are now finding in surface waters. Do you have an answer for that, or a personal preference?

DR. TONES: No, I don't. The PPWB Committee on Water Quality wrestled with that for some time, and eventually went to a more general statement because of the difficulty. I guess I feel that, when you go to general statements, all you are doing is delaying the question until the next step. Sooner or later, you have to find out whether or not that concentration of a substance is a problem.

You can either do the research up front before you set the objective, and perhaps revise it as we have talked about, or you can put in the general statement and then do it once you get to a specific problem in a specific watershed.

MR. WILLIAMSON: I would agree with that. I think in order to determine whether or not we have a problem with individual pesticides, we must have some scientific toxicological data pertinent only to that pesticide. I think we are lacking this information in many instances now.

DR. CAREY: I think you can simplify the process a lot though. Basically our understanding is incomplete for just about any pesticide you can name. I think we would be in a lot better shape if we had a limited few that we understood reasonably well; then you can make comparisons. I

think the first order of business should be at least doing one pesticide well, and then refer back to it.

MR. GREGOR: I think this is a perfect case where we need good monitoring data. Referring back to the discussion of the first panel, we are presently working with pesticides. Most of which we can't identify in water samples using our current field methodology. Whereas, if we knew certain pesticides were in the aquatic environment, it would then justify undertaking certain kinds of work to set objectives or identify research needs related to these pesticides. At the moment, we are working in a vaccuum of information on many of the current pesticides in use.

DR. WAITE: I guess I am going to change the topic a little bit, perhaps, and go back to something Pat Tones talked about.

You were discussing the major ions and nutrients and diverted from toxic organics. It is actually relatively simple to set objectives for the toxics, because there is a specific biological response that you can work with. There is usually some background information on the toxicology, mobility and degradation of the chemicals rates. There is very little comparable on common phosphorous, common nitrogen, major ions, calcium, sulphate and carbonates.

When you talk to the people who do research on, for example, phosphorous and ask them what will happen if you change the concentration of

phosphorous in a system plus or minus 10 percent, they generally won't answer the question. They are not capable of extending their research information to answer a simple question and, yet, that's the question that faces anyone who sets water quality objectives.

We do know, for example, that a change in the nitrogen concentration can effect blue-green algae blooms and yet we can't predict accurately enough to set those objectives.

Perhaps Pat would like to comment.

DR. CAREY: Let me register an objection to what you said about organics. I don't agree with that for a minute. I think if you are talking about dead guppies maybe enough data is available. If you are talking about synergistic effects in a real system, or long-term trends, that's not true at all.

DR. WAITE: But considering the amount of time people have been studying nutrients in the system, there is even less information on actual impacts and predictability of impacts than there is on the toxics.

DR. CAREY: I don't think we have enough information on anything that allows us to predict effects.

DR. HAFFNER: Could I comment on that? I would like to comment from a

biological point of view. It sounds like we have two chemists arguing a biological problem.

I would like to make a comment that refers back to John's comment that we should all be CO_2 and water if you are going to adhere to the rules of thermodynamics.

The problems we have with phosphorus is we ignore the biological availability and utilization of phosphorus. It is the same type of problem which I think John Carey has referred to in terms of organics when speaking of bio-availability, bio-accumulation, bio-concentration. What we are really missing here is the fact that we are looking at a chemical and its chemistry not a biological response. It seems common that biological responses get ignored and a chemical concentration is assumed to be of biological importance.

The same process happened with phosphorus, and we know now it didn't work. We are ignoring what tests like LC 50's were actually about. Those tests are basically to test the tolerance or the responses of organisms. When we talk about objectives and uses, if the objective is going to be to protect aquatic life, then we can have a good discussion, but when the use is going to be drinking water or recreation, obviously, we are into a different kind of argument. I think that's what we are missing here, John, is that it is always going to be complicated to relate chemical concentrations and biological response. A lot of what our tests are based on aren't that relevant.

DR. CAREY: But some of the factors are natural factors that the tests aren't designed to sort out. I know in the case of TFM treatments . . . the stressed fish will die. There is always a fish kill associated with it. If that happens to be a small population over the space of five or ten treatments, you probably effect the population significantly.

When you do a lab experiment and measure the concentration, it should have been totally safe in terms of things like contaminant levels, or where the fish was for the last three days or what the oxygen conditions were. Generally, the site specific things or ecosystem-specific things which are important are missed from most tests we are talking about. I think if we did a really good case for a watershed or an ecosystem, for specific contaminants, we would be in a lot better shape.

DR. HAFFNER: I agree and I wish I lived in the world that Dr. Carlisle earlier outlined. Unfortunately, most of our programs are menu-driven right now. They are not really designed to go on the approach you have just suggested. Basically we are capable of doing routine measurement with minimal resources. We have a set of chemical parameters that we measure routinely, and we collect samples in that manner. I think it was called an imperfect radar system a while ago, an early warning system. I think there has to be a big change, and I am really surprised, today, that we have gone through the data collection aspect and partly through the research aspect, more or less examining what has or is occurring, as opposed to what should be occurring.

DR. CAREY: Actually, the panel decided that when we come back from lunch, we were going to pose that question to the audience, what should be occurring?

DR. TONES: On the importance of major ions and nutrients, we have to look not only at what is urgent, but also at what is important. I think toxicity becomes urgent because it has mass appeal. You talk about radionuclides and the public gets upset.

These are topics that are urgent, but we also have to look at what is important in the long term, even though it may not be urgent now. Increased salinities in our water is a concern that will become important over time. Salinity is extremely difficult to turn back once it has occurred as a result, for example, of the gradual increase in the draining of saline lands. It will be hard to argue against putting land into an agricultural production. Likewise, the formation of reservoirs, which are so necessary will increase salinity. Evaporation is one of the major "users" in reservoirs. As surface water supplies decrease on the prairies, ground water pumping will increase causing another increase in major ions.

From all of these sources, major ions will gradually, I think, accumulate over time, yet objectives or guidelines for major ions are virtually nonexistent. We know that salinity has physiological effects at very high concentrations. There is some information that shows correlation

between phytoplankton, say, and some of the major ions. Examples like that show a correlation but certainly not a cause and effect. We need information to show us when a serious change in the community occurs as the major ions increase, or as the ratio of the monovalent ions increase. Most effects by man increase the monovalent ions, so potassium increases over calcium. When does that become critical? I don't think we know the answer to that. It is a question that is not very exciting, and I don't think researchers are really interested. I think it could become a serious problem over time.

Nutrients already are a problem. Fish kills in the prairies are most often related to low dissolved oxygen, which comes indirectly from high nutrients or high temperatures, and are seldom related to the more exciting causes.

MR. HAMILTON: I would like to ask a question about one thing we have discussed a lot this morning; taking guidelines or criteria and adapting them to develop site specific objectives.

It appears to me in looking at most of the criterion guidelines as have been doveloped to date, that it has largely been based -- I'm talking mostly about aquatic fauna now on work done on species that are indigenous to eastern Canada or the eastern United States, and we are now talking about taking those kinds of criterion and adapting them in the west.

Perhaps, Pat, you could give us some comment on, what are the dangers of this? Do we need to, is it appropriate to do it, or conversely, do we need to spend a lot of money and effort developing scientific criteria for our indigenous fauna here in western and northern Canada?

DR. TONES: I don't know the answer. I have a gut feeling, as perhaps you do, that we should develop guidelines carefully, at least once or twice and find out before we go on assuming that we can just use the data from eastern Canada. Also, we should find out if, in fact, that body of information relating to only a few fish species really is useful to us, protecting our important species in western Canada. I think the "research need" is to test the applicability of existing lab data.

DR. THOMSON: I think you have sort of echoed my sentiments in the whole thing. John mentioned earlier that we are trying to take Great Lakes results and apply them in the west. That's one thing, but we are also trying to take North Carolina results, or Florida results, and apply them in western Canada, not only western Canada, but in the Northwest Territories. And that may or may not be a whole new set of problems. We haven't even begun to come close to deciding whether or not that's a problem.

DR. PIERCE: I think you have to be careful of trying to obviously take that kind of information and develop objectives. One of the major modifying factors, as you mentioned, is the presence of indigenous

species. You have to be cautious that the laboratory tests that have been done compare with other laboratory tests and field conditions.

One of my concerns is that we are trying to take that kind of information and apply it to a natural or a specific site, and there's a lot of danger in doing that. It gets back again to the point of what is the minimal amount of information that you need to generate or gather, in order to develop a site specific objective. One of the pieces of information you need is the resident species. You must access the toxicological information on that species, and if there is none, then you are going to have to try to generate some.

MR. HAMILTON: Just along that line, there is one other point I would like to make.

We talk a lot about future data needs and changes in our data requirement. I think one thing we can perhaps be faulted for and which might help shed some light on this, for a long time now, we have been collecting inventory data on biota, and we have been doing the same thing in terms of long-term networks for water quality.

I think often enough, we don't look and compare the two and really start defining what are the environmental conditions under which our indigenous species are living, and then go from there in terms of developing lab experiments or whatever. I think that we could do a lot more with what we have got.

DR. PIERCE: Yes, it is not just a one-way street. You have to somehow bring together laboratory toxicological information with ecosystem research and hopefully have the two intermix so that you get the maximum amount of information with the minimum amount of effort.

DR. CAREY: Basically what we have been wrestling with is how the system should look right now, as opposed to how it does look. We thought, just to get things started after lunch, we would throw it open and find out if anybody has any strong opinions, some specific changes they might like to see.

MR. DUNN: I would like to see more work done, with respect to in-situ type field work. I think in the past, we have seen research hidden behind locked doors, and more lab-orientated than oriented to real situations in the field.

I would like to see more field research done, more specific studies related to pertinent regional problems. As Pat Tones mentioned earlier, more work should be done on total phosphorus on the prairies. The present criteria information on total phosphorus is not applicable to streams in the prairie provinces. If more appropriate criteria could be developed for nutrients through research oriented special field studies on the prairies, it would be extremely helpful.

MR. FREDEEN: I wonder if there is anyone that monitors the quality of

water that comes out of domestic taps? Are the departments of environment only interested in what goes into the water system at the outside, but not what comes out on the inside? Because once water comes down the pipes, it is probably different than what comes out of the water treatment plants.

I am thinking of water that goes through copper pipes. If you are worried about copper in the environment, well there is probably more copper coming out of the water taps than out of the natural environment. Also, what about landfill operations that are very close, like at Saskatoon, very close to the water intakes? It is such a short distance there that I wonder whether that is affecting the water quality.

DR. CAREY: I know that Health and Welfare get pretty uptight if we start sampling finished drinking water. They generally view it as a human consumption problem and their mandate.

We have been invited to sample and provide advice on drinking water sources and their suitability and what might be present, but that's just in a pilot stage.

DR. HAFFNER: That will be coming off the ground, but it's not so much oriented at drinking water itself, but the watersheds in which there is a drinking water use.

DR. CAREY: That could be described as water quality assessment at source.

DR. HAFFNER: That's right. You are right in the sense that we don't have the mandate to actually go looking directly at drinking water. It is a very touchy federal-provincial concern, probably best to be dealt with under the coordination of this kind of a session we are having right now. It is a very touchy issue as to who samples what. Even within a province, it is often a touchy issue.

DR. PIERCE: To get back to Gary Dunn's comment about more field research, perhaps we should have asked the question, is more better? How much research do we have to perform in order to answer a specific question, or can we even ask a specific question? Should we try to develop some type of rationale or some kind of procedure for trying to identify where the gaps are, and then trying to fill out those gaps with directed research, as opposed to going out and doing labor-intensive broad scale surveys or things of that nature?

How should we proceed?

MR. DUNN: What I was referring to was specific type studies related to problems that have already been identified on the prairies. Dr. Pat Tones identified earlier about five problems that required work in this particular region.

I think the main problem lies in the area of field studies. A lot of our information gaps relate to chronic rather than acute toxicity. I think there has to be more coordination and feedback between research in the field and monitoring to be able to determine the chronic effects, rather than the acute effects of various substances.

DR. PIERCE: And also laboratory studies, as was mentioned this morning, trying to bring all those aspects together and having them be representative.

MR. DUNN: That's right.

DR. CAREY: I suppose a lot of biologists will wince when I say this, but I wonder if it's possible to develop a set of standard conditions to represent situations in the prairies. These would probably be a little better than conditions under which tests are conducted right now. Present concerns focus on Great Lakes conditions, and these are communicated to the research community as the set of things to be worried about.

MR. GODWIN: My answer to what you say is that it may not be possible to establish a standard set of conditions, but we know that the type of conditions that are endemic to the prairie provinces are not the same as conditions that will be endemic to the Great Lakes situation.

What we need is field research, the type of research that Gary Dunn is talking about. We have some research that is field related, but (for example) we don't have an overall research program from the time irrigation water leaves the headworks of major irrigation works until it returns to the river.

Finally, what happens to a stream's water quality in a dry year such as 1984 or 1985 when only 60 to 70 per cent of the natural flow reaches Saskatchewan. What will be the decrease in quality of that water? Can you divide the quality the same as you do the quantity, or do you have to develop a new set of "rules" to account for build-up and losses in quality.

These changes are only found if you do field research. They are things we guess at now and they are problems we will have to face in the future, tough problems, unless we can get answers from the people that have done field research. Some administrator, in the future, will have to make a decision. It will be a guess, maybe the wrong guess, if he doesn't have facts on which to base that decision.

DR. PIERCE: You mentioned the fact that you could get these answers from the researchers about the endemic conditions. Perhaps it's a question of notification. Do the researchers know, even within this region or nationally, what these types of problems are that are endemic to this area?

MR. GODWIN: If they don't know by now, they haven't been listening. They have been mentioned.

DR. PIERCE: What I am asking then, what are the mechanisms that are in place to translate those concerns? And if it hasn't been successful, how should those be changed?

MR. GODWIN: I am saying the questions are being asked, but the answers are not being provided in the form of research to get that type of thing. Somewhere along the way, somebody needs to start listening to them.

MR. McKERNAN: As an environmental impact analyst, and I guess a typical information user, one of the things that has struck me the last several years that's often been given insufficient priority of attention (and I see it's been remedied in Saskatchewan) is the focus on data interpretation. Too much of the monitoring historically has gone on simply, as we all know, and this isn't an original thought, because where you park the trucks is where you took the sample, irrespective of how those data relate to the larger research question that we wish to get at.

It seems to me that, and again, referring to something Dennis Windsor talked about, in Manitoba, where so much of the work that we are doing has legal consequences, you have to be extremely careful about what you're doing and why you're doing it. It is extremely frustrating to go

back to the database and find that it really doesn't lend itself to interpretation vis-a-vis, a watershed, a drainage system, a particular kind of impact that you wish to evaluate.

I would like to suggest that where we can, in terms of influencing where programs go from here on in, we make a commitment to interpretation that is every bit as strong as our commitment to generating numbers. We should commit that every monitoring program terminates with a report, and to the extent that people responsible can do so, they are on the record. They should go out on a limb and make a judgement, with all the caveats they wish to put on it, and anybody following after that can build on that judgement. But too much monitoring data is simply archived without interpretation.

DR. TONES: I would like to suggest that, if that happened, it would be another loop in which the monitoring would be improved. You would see the flaws in the monitoring system as you tried to write that report. Recommendations on ways that monitoring could be improved would be the logical end of that report.

MR. McKERNAN: That's right. It is really based on an iterative concept, but it begs one essential thing, and that's access to the data.

And I notice recently the American Institute of Biological Scientists has found it necessary to affirm the concept of universal accessability to

data, which stuns me, that that would have to be affirmed. But in fact, notwithstanding any judgement about whether people wish to share data, there are mechanical impediments to getting access to data. To go through this kind of iterative exercise, one of the ironies of computerization and computer storage is that it limits accessability. It actually hinders, in my view, this iterative process. You can't get at it easily. Its all tied up in someone's computer storage.

DR. PIERCE: That's assuming that the data are there to start off with.

MR. McKERNAN: Yes, that's a fundamental assumption.

MR. FAIRBAIRN. I would just like to mention something briefly relevant to what Bruce Godwin was saying about identifying needs and problems of getting researchers doing field work or working on specific problems for this region. Anybody involved with or close to research in the federal government knows there has been a lot of review of our National Research Institutes, and I think that Bruce is well aware of this fact, that NHRC will be established in Saskatoon in order, to a large extent, to help address this. So I don't think that the problem is unrecognized. There is a lot of effort directed to putting federal resources into that.

DR. CAREY: I Would like to make a general point about the quality of the data that is already stored, even if it is inaccessable. And just a couple of personal observations because as Dr. Carlisle has pointed out, some of those are usually more valuable than generalizations.

If you want to do a sediment sample, suspended solid sample from the North Saskatchewan river, you can't use a standard gel permeation chromatography clean-up because it irreversibly damages the column, for some reason that we don't understand, but it is peculiar to western samples and at $500 per column, we don't want to do that. The effect is that the next samples through the column suffers irreversible absorption and looks clean, so you get a lot of nondetectables. We use columns in the Great Lake samples for 50 times before we have to clean them up, and our North Saskatchewan columns we can only use once.

If you didn't know that, and we have sort of discovered it by accident, we would have a lot of nondetectables in clean reports which you couldn't rely on, from a method that's been fully validated for another region.

The other observation is the amount of sulfur in some of the samples out here is just phenomenal. You can get sulfur crystallizing; pure crystals of sulfur. So that even our analytical methods that we believe in routinely, just don't hold as soon as you leave the region they were validated in and go to another region. You go back to square one. And what I really think the danger is, is that we are not going back to square one. We are taking a lot of things to which a lot of effort has been devoted in the east to answer these questions for that region, but we don't really understand that's the only region that it has been answered for. It is a real danger. You can't emphasize it too much, from my limited experience.

MR. GODWIN: If I understand Dr. Carey's comment correctly, what you're really saying about that sediment sample, too, is that there's a big difference between sediment in the prairies and sediment in eastern Canada.

DR. CAREY: In the North Saskatchewan River there is. It doesn't compare in any way with the sediment in the Great Lakes, for which the methods have been developed.

MR. GODWIN: I think that reinforces my point.

DR. BELLIVEAU: In that case it might have been a bad move to take the laboratory away from Water Quality Branch in the western region and locate it at CCIW.

DR. HAFFNER: Just one question. Who are these researchers? I think I know what research exists in NWRI, at least the water quality objectives side of the work. We don't do any criteria work, basically. We have a little bit of methods analysis. I am not sure what fisheries does in terms of a research program appropos this kind of work.

I am sure most provincial agencies don't have large research institutes at their beckoned call either. Most universities can't afford to get into this kind of field. What researchers are we talking about?

DR. THOMSON: Essentially, it is kind of like the old euphemism that somebody should do something about it, whoever somebody is. I agree with you, Doug, and we tend to sit and talk about "they."

Your point is very relevant, and in this gathering here today, I think there are potential researchers. I specifically asked people from other agencies to come and sit in. I think that we are at fault, for not knowing who the researchers are because we should be creating the researchers. Maybe we should be the researchers ourselves.

MR. DUNN: What you are getting at and it hit me, well who is "they"? We don't do any criterion work, and it hit me, well why don't you do any criteria work? Why don't you become they?

DR. BJONBACK: We have been talking up to the moment here about biophysical science research in support of water quality objectives. I was wondering if the panel had any thoughts of the kinds of social and economic research that might be necessary in support of a successful water quality objectives program?

DR. THOMSON: I think, Ron, you could best address that. In that the last transparency you showed, you talked about the physical aspects.

DR. BJONBACK: There might be another column identified as "social and economic".

DR. PIERCE: I think we are having great difficulty identifying the research that needs to be done from a biophysical standpoint let alone the economic-social aspects at this stage.

DR. BJONBACK: Well, I think that if you cut it off there, you might end up with a program that might not be viable, in the sense of not meeting the broader social and economic objectives that both levels of government might have.

I agree that the whole biophysical science side is uncertain. However, both the biophysical and social-economic aspects have to be considered as I understand, you know, we have to take both along at the same time, concurrently in order to come up with meaningful water quality objectives. You would be going only as far as water quality guidelines, if I understand the concepts of guidelines and objectives correctly, if you proceed only with the biophysical sciences side.

DR. PIERCE: Yes, if you are looking at the objectives, then by definition you have to look at social and economic factors. If you are looking at guidelines only, then you do not look at the social and economic aspects. Objectives are regional or site specific activities.

DR. BJONBACK: Yes, very much, and that's why I think it is a difficult problem. It depends on federal-provincial cooperation, and the appropriate level of federal involvement, given jurisdictional

considerations. You know, that's why I'm not sure either. That's why I am asking the question.

DR. PIERCE: I don't know what mechanism we can put in place to address that kind of issue.

I turn the question back to the audience. Do you have any idea on how to put that kind of mechanism in place?

DR. BJONBACK: No. However, I think that the CCREM exercise could have undertaken an examination of social and economic considerations. The constraint that often surfaces in federal-provincial forums is that as soon as we look at the social and economic side, we get into areas that are primarily under provincial jurisdiction. It becomes a very sensitive issue how far the federal government should become involved.

We know it is necessary. But perhaps the provinces should do their own work first, in the sense of doing the appropriate water use and demand forecasting studies. The federal government would get involved in perhaps a later stage.

I am concerned with the strategies that leave socio-economic considerations permanently behind, as the race proceeds to develop the biophysical sciences side. As a product then, you have some pretty good work done to support the whole objectives exercise on the biophysical

sciences side but you have left behind considerations of economic (and perhaps administrative) practicality. So you have excellent information on one side, but information in terms of implementation is not very good.

DR. PIERCE: That is one of the reasons that I commented that the guidelines work was only the initial stage, the first step in this process.

Again, we don't know what the next stages will be, as far as developing objectives from the guidelines.

MR. BECKETT: It seems to me that this whole process has gotten a little out of the real world. The hope is to have a list of objectives that will meet all of our concerns. Everybody here has indicated that they don't fit because the data are inadequate. It occurs to me that maybe the orientation is wrong; that instead of hoping for a list of objectives, the most that we should ever hope to get is a list of criteria, very absolute numbers that have their own limitations, as long as those limitations are well documented. Go the route of coming up with interpretation and application procedures. In 80 percent of the situations you wouldn't have any problem because you are looking at situations such as do you want the mercury above this amount or not. I don't think you are going to have a lot of difficulty in fairly easily deciding if that's an appropriate number or not.

But in other situations, where you might have strange in situ circumstances, it would be useful to have a standardized protocol that you could go through. You would make sure that all the necessary questions and answers were dealt with, and you can even include social-economic things. Thus, you make sure that whatever objective you come up with, takes into consideration any specific social-economic characteristics of that region.

As a result, when you reach a circumstance where you have got something that you just don't know, you manage to narrow it down. We don't know what is happening here, and that's when you say, the research need is for this. Additionally, if you are not going to fund it, then I really have to ask the question, what importance is it if you can't solve that problem yourself?

DR. PIERCE: That's a good point.

DR. CARLISLE: I would like to come back to the question of the request for more field research. I must say I sympathize with you here, but I think you are putting the cart before the horse.

What we should be doing is identifying very carefully the questions that must be asked, and maybe specifying that these are best answered through field research. We have to ask specific questions of our research scientists, or at least indicate the areas where questions must be asked

properly, before answers can be thought. You can't just say let's go in the field and find an answer, when you haven't already asked the question.

MR. DUNN: Maybe what is lacking is the formal mechanism for this process.

DR. CARLISLE: It probably is.

MR. DUNN: Mr. Godwin mentioned earlier, that people have been talking in the last few years about these problems but talk is cheap. Is there an actual formal mechanism to get this thing working? Probably what is required is to transfer our concerns in writing to the research group and to follow up on these concerns.

MR. GODWIN: The concerns we have are specific concerns.

DR. CARLISLE: Yes.

DR. NICHOLAICHUK: Just to follow up on what Bruce Godwin indicated earlier, one of the exercises I have pursued in making my move to NHRI in Saskatoon was to try and determine what the research needs were. Prairie Provinces Water Board and many other agencies have come up with lists of things that may serve as a working document for us as a research group to concentrate our efforts. More importantly, the document will identify areas of cooperation and with agencies such as SRC, who have a similar interest. At this time, I don't think there is any formal mechanism to coordinate research efforts.

DR. THOMSON: Dennis.

MR. GREGOR: A personal opinion of my own on this matter of a formal process for transferring information is basically that a formal process did exist; and unfortunately, that's why it didn't work. This formal process consisted of middle management in the research area talking to middle management of the other agencies. The information was never really taken back to the researchers in an effective way. Further, I think the evidence of John Carey and Brian Brownlee being here and other researchers being involved in Western and Northern Region right now, is because it has been happening in an informal process, and that's the way it is working. It has never worked in a formal way, and I am not convinced it ever will.

DR. THOMSON: Yes, I might follow up on that, in agreement with Dennis, in that I have seen, in only speaking from Environment Canada's viewpoint, when Gary speaks of mechanisms, we get too overmechanized. There are so many committees, so many working groups and so on, all aimed at identifying this and in consulting on that. But we lose sight of the end product, and I think that's the most important part and it relates to the types of things that Dennis Gregor talks about. So we have to keep this at the back of our mind that we shouldn't look at mechanisms for mechanism sake.

MR. McDONALD: In talking about the end product, how do you find out

what's going on in Canada vis-a-vis federal activities and provincial activities, because there could be some stuff that is quite analogous to site specific problems, regardless of Great Lakes or the North Saskatchewan rivers.

DR. THOMSON: I would like to answer that, actually, and I think really what you are doing is making a suitable introduction for the topic of the next panel, and that's a question that I have had, and that's a question that I would like to see us working toward overcoming in meetings such as this, rather than committees and working groups and so on. Perhaps you could once again ask the question, or we will keep it in mind for the next panel. I am not trying to put you off there, but I think they will answer your question.

(Workshop adjourned at 1:20 p.m.)

(Workshop reconvened at 2:35 p.m.)

As I was saying to Rodger McDonald before we broke for coffee this workshop, and the premise upon which it was based, is essentially an opportunity for cooperation, and opportunity to promote the concept of water quality objectives, and opportunity for us to meet on a formal and informal basis to exchange ideas, to meet each other to put faces to the names.

The three people who are gathered here today on the panel, all have

worked in a formal sense on cooperative agreements, federal, provincial, international agreements, with regard to water quality objectives.

I hoped that in assembling them, we would be able to borrow upon their experience from their formal participation, and their informal participation in this field, in order to get some ideas and toss them around of, how do we get the information? How do we share ideas? How do we convey information to the research scientists, whoever they are? Perhaps how do we identify "they"? How can we share ideas and methodologies? And perhaps ultimately, some day down the road, lead to maybe enhanced formal relationships.

On my immediate left is Mr. Don Fast who is Director of the Water Pollution Control Branch of Saskatchewan Environment. Don has been involved in this business for a long time, in terms of objectives. He was, involved with the drinking water guidelines which Health and Welfare Canada ultimately produced. He has been involved in the objective setting and maintenance exercise for the East Poplar River, and most recently he has had a high degree of input to the CCREM exercise.

To his left is Dr. Doug Haffner has formerly been with the IJC Windsor office and is now with Water Quality Branch headquarters and is the Head of the Agreements section of the Monitoring and Surveys Division at headquarters. He has been involved in the negotiating of formal federal-provincial agreements on monitoring, and he also has been

involved with me in writing a couple of papers with regard to relationship between monitoring and objectives.

And to his far left is my opposite number from Atlantic region, Dr. Paul Belliveau. Paul is the head of the Guidelines and Agreements Division. He is involved not only in the negotiation of the federal provincial agreements I referred to but he has been involved for a number of years on interjurisdictional, international agreements on the St. John River, which has produced a number of objectives.

MR. FAST: I am going to briefly comment on some of my personal experiences with interagency projects, and just before I get into that, I would like to say I am glad so many people have turned up today. I haven't been able to be here for the whole day, but I think discussions like this are an important part of interagency activities. Communications are very essential and just being able to get together in an informal way like this and to share experiences, helps us understand one another.

My experience with interagency projects started when I was with Ontario Environment. I went to work for them in about 1968, and while with them, I had the opportunity to participate in a study with Quebec on the Ottawa River, and also on an international study on the Rainy River, and then some work on the Great Lakes.

Since coming to Saskatchewan in 1974, I have also worked on a number of projects. These have included the Canadian drinking water guidelines, the Poplar River project (which involved a number of U.S. agencies), the Prairie Provinces Water Board's, Committee On Water Quality. The latter committee is a very successful interagency group, and has a proven history of cooperation.

I have had quite a variety of interagency experiences, and I would say for the most part, these have all been very positive experiences, and I think they have been beneficial to the participating agencies, whether these were federal or provincial.

Some of the ingredients that I have observed during these projects, which I think have helped make them productive, include the following. First of all, a willingness by each of the participants to be involved without necessarily achieving 100 per cent of their agency goals. And that's very important because at best, you are going to achieve in the 70 to 80 per cent range. If you start out with some expectation that you are going to go into a cooperative effort and convince everybody to do it your way, you are just not going to be happy with the outcome.

Another aspect of this is the opportunity to have meaningful input to a project. There have been instances where, I guess I felt a bit used, in that I got the distinct impression that the other side was getting my input just so they could tell somebody above them that they had consulted

with me. But there was no evidence that the input I was providing was going to have any impact at all on the project. It's a give and take thing. There must be opportunity for meaningful input by all of the participating agencies.

Another item that I wanted to mention that I think is very important for a successful project is the handling of controversial issues. This is particularly important for public relations events. Those projects that have been particularly successful have included sensitive handling of the public relations and the whole communications aspects.

Some things that have not contributed to a positive experience and which, I think have caused some concern and breakdown in the process, have involved sensationalizing of the information and reports. And I realize that might not always have been intentional.

For example, you may have someone who is just not that adept at dealing with the media, or not that experienced in that area. I think it is important that the senior people in the project recognize those areas of speciality and those needs and make sure that the people dealing with the press or the media have some experience, and that they have some abilities. You can take a project that is going very well, and because of an inexperienced person, suddenly it gets blown out of proportion in the media, and the cooperation dies very quickly after that, believe me.

Another concern that I have had over the years is a failure to follow through on agreed to action, or carrying the process only partway.

One thing that particularly disturbs me is people who like to help you identify problems, and then the problems having been identified, they would like to know what you are going to do. In other words, the cooperation is now over, and what are you going to do to solve the problems.

Let me tell you, I have enough problems on hand now to last me for a whole lifetime. I don't need any help finding new ones, unless you are willing to help contribute to the solution, as well.

The last area that I would mention, that's been of some concern, is occasions when there is some back room manipulation that doesn't involve all of the parties. I think in any cooperative effort, it is important that all of the parties have access to the discussions and the information that is exchanged, and that one or more of the groups are not left out.

In conclusion, I think cooperative efforts are very important, particularly as we are all feeling the bind of resource cutbacks and tight budgets. As a provincial water quality manager, I have an opportunity to spread my resources many fold, if I can cooperate with federal and other agencies. And so I am very willing and anxious to do

that, and I think there's a very high degree of probability of success if we are willing to give and take and have open communications.

Thank you.

DR. HAFFNER: I am glad you said that. What I would like to discuss right now is: one, the problem as to why we need coordination, and secondly, what are some of the solutions which are available to us. In terms of coordination, I think we need good coordination of environmental assessments and developing water quality objectives.

As Don just alluded to, environmental monitoring across Canada is generally tending to decrease now. Most provinces either have a program held at status quo or gradually falling behind because of inflationary increases or similar types of things.

So on a general basis across Canada, one is finding we have to do more with less. We don't have much room to take on new work. This is true also on a federal basis. The federal program, although not decreasing, probably will remain at the same level of effort.

As I said this morning, a lot of these programs are basically menu-driven. They have been cut back to a point now where they become very, almost too, routine. We basically go in and look for compounds for which we have procedures to look for. It is not really a good radar system either.

On the research side, I think most people here are aware of the general review of the research within Environment Canada, which mentioned the lack of clients. It is a shame the reviewer wasn't here today. I think he would have found plenty of clients for research on water quality or water quantity in Canada.

There are good examples where coordination has worked. And I think one of the prime areas of this is the Great Lakes. I think everyone here would agree that the best data base for water quality, probably exists in the Great Lakes, which is rather strange because the data base were gathered together from eight states, one province, two federal agencies, and all sorts of other sister agencies, such as U.S. Fish and Wildlife Service.

Yet basically, all this has come together to form a very significant data base, and actually is considered to be a monitoring experiment which the rest of the world is looking upon; asking, 'Have the pollution control methods worked? Has the phosphorous reduction worked? Are the effects of contaminants declining in the Great Lakes?' It really is an area where I think people can say, yes, coordination does work. It can produce something worthwhile.

This data base was formed, of course, under the Great Lakes Water Quality Agreement, but it wasn't the agreement itself that really developed that data base. I think what developed that data base is something that Don Fast alluded to, I think it is called trust.

Basically, you have to be able to work with the person next to you, and you have to be able to exchange ideas in a candid fashion with a fair amount of trust as to what is going to be done with that information, or what you will do with the other persons information.

Now on the federal side, as Ken mentioned, the federal government is trying to negotiate water quality monitoring agreements with the provinces of Canada. I think the underlying theme behind this is that we are trying to develop comprehensive plans for water quality assessments in Canada.

This tends to indicate we are after three basic data bases. One of these is a long-term data set. This is basically achieved by setting up index stations in a river basin where there are common federal and provincial concerns.

The next data base is one which has not really been developed yet. I was hoping someone else would come out and say it more directly than I have to now, and that's developing a data base for water quality objectives, either for the development of water quality objectives or for the assessing of compliance or the verification and validation of water quality objectives. Basically, we don't have a data base like this at all. It is a definite need.

The third type of data base we are trying to develop is for environmental

impact or state of the environment. We do have the techniques, although we tend to be lagging behind, again because of the resource problem within the provinces and within the federal government themselves.

Along with these agreements comes some other interesting aspects. One of them is a quality assurance program. There is right now no national quality assurance program in Canada. It is difficult to exchange noncompatible data. We basically now have ten provincial programs. We have five federal regional programs, and basically, we don't have a national picture. It is hard to put this sort of data base together without a quality assurance program. We also need a data exchange mechanism to make data readily accessible in a timely fashion to all participants.

What I consider to be the most important of all is joint interpretation. I think right now we tend to be a little bit parochial in our data interpretation. That is, we can interpret data to our own mandate, whereas through an agreement, we can broaden our horizons a little bit.

So in many ways, these agreements can be a solution. It is interesting to hear today the needs for cooperation, yet the most difficult agreements to negotiate are in the prairies. This is where, I think one has to separate the political boundaries from the scientific boundaries. I think at the level we work at, we can still do the job, whether there is that signed piece of paper or not.

DR. THOMSON: I will just interject. To be fair to Saskatchewan, we haven't started negotiations with them yet.

DR. BELLIVEAU: The St. John River basin is one of the largest watersheds in eastern North America and drains approximately 20,000 square miles of Maine, Quebec, and New Brunswick into the Bay of Fundy. Stretches of this river form the international boundary between Canada and the United States, and a number of its tributaries cross international and interprovincial boundaries. In other words, a portion of the river is interjurisdictional. So to do any work there, you must have a number of agencies involved.

In March, 1971, following a series of meetings in Canada, the NATO committee on the challenges of modern society, studying inland water pollution, selected St. John River basin as a case study for international cooperation. The following year, in 1972, at the U.S. Fish River Lake Symposium, an agreement was reached by the governments of Canada and the United States on joint measures to cooperate in water quality planning and to recommend programs to enhance water quality in the St. John River.

The Canada-U.S. committee on water quality in the St. John River was subsequently established, and the IJC was designated to oversee the work. The Canada-U.S. committee on water quality of the St. John River, which I will refer to from now on as the parent committee, is composed of

representatives from the U.S. Environmental Protection Agency, the State of Maine Department of Environmental Protection, Northern Maine Regional Planning Commission, Environment Canada, and the New Brunswick Department of Environment.

In 1974, the parent committee set up a working group to draw out water quality objectives for the international waters. The recommended water quality objectives were submitted to the parent committee in 1975, but were subsequently rejected for reasons that are beyond the scope of this present discussion.

As a result, in 1979, the parent committee set up another subcommittee called International Technical Advisory Subcommittee or ITAS. It's job was to review and revise the original water quality objectives taking into account the concerns expressed by the various participating agencies.

ITAS draws membership from a group of working-level scientists representing Environment Canada, Fisheries and Oceans Canada, New Brunswick Department of the Environment, Quebec Department of the Environment, U.S. Environmental Protection Agency, U.S. Geological Survey, Northern Maine Regional Planning Commission, and the State of Maine Department of Environmental Protection. As can be seen, its membership has broadened from that of the parent committee.

All of these agencies, however, have a direct interest in the

interjurisdictional waters of the St. John Basin, and therefore willingly participate. ITAS developed a new set of water quality objectives and also formulated a monitoring and analysis program for the international waters. Its report was submitted in September 1980, and the objectives were officially adopted by both the American and Canadian federal governments, and both the state and provinces in 1984.

Utilizing the recommended monitoring plan, participating agencies have monitored the international waters since 1979. A number of special intensive studies have also been conducted in various regions of the river and its tributaries in order to address specific problems. To date, two reports have been published, and a third is in preparation. All of their work done to date was performed on a voluntary basis. ITAS itself, the committee, analyzes the results of the previous year's work and makes recommendations for future monitoring and special studies.

Based on these recommendations, ITAS prepares an annual work plan without assigning specific tasks to any agency. Individual agencies then volunteer their services for specific tasks relating to their overall departmental program. The work load is therefore shared among a number of agencies, and the studies are done using existing funds. At times, certain studies or specific aspects fall between the cracks. But in general, most of the recommended studies eventually come to fruition.

In conclusion, the experience I have had with ITAS can only be considered

as positive and demonstrate what can be done when individuals are committed to doing specific tasks.

Thank you.

MR. DUNN: Dr. Belliveau, you mentioned that ITAS analyzes the annual data results and then makes recommendations on specific studies. Who do they make the recommendations to, and who decides as to whether those studies are going to be carried out?

DR. BELLIVEAU: ITAS itself analyzes the results of the previous year's work, prepares a report, and makes recommendations. These recommendations -- the report itself is submitted to the parent committee, the Canada-U.S. committee on water quality. But along with the report, each of the agencies has seen what the recommendations are (because they are involved in this), and have decided which portions of it they would like to do the following year.

With the recommendations, we submit another memorandum saying, "Of these recommendations, the following are going to be addressed next year by the following agencies". In other words, by the time the parent committee gets it, it has actually already been decided which agency will conduct which part of the work.

DR. THOMSON: Mr. Fast, is that done with the Poplar River situation, in terms of allocation of tasks?

MR. FAST: Through the initial process, at least.

DR. THOMSON: How does that work on the Poplar, in terms of dividing up the tasks? Does it alternate between jurisdictions?

MR. FAST: Actually the governments have not formally agreed to the recommendations of the task force on the Poplar yet, but there has been an informal arrangement between the state and the province, whereby for the last several years we have had an ongoing exchange of information. There is a bilateral committee that examines the monitoring data and exchanges information.

Earlier this morning, I think there was some discussion of the formal versus informal processes, and I think that's something that the managers have to bear in mind. Sometimes it's not possible to enter into a formal agreement because of the politics or the long-term ramifications or whatever. In spite of that, you can sometimes get a very good working relationship at the technical level and really achieve a lot, in an informal way, without having to go through all the hoops of signing agreements and so on. You can achieve the goals that you have in mind and have a very good working relationship.

DR. BELLIVEAU: I must admit a while ago when I said some of the studies fall between the cracks, what would happen is that maybe none of the participating agencies, at the working level, offered to do a particular

study. However, by the time it reached the senior level (the parent committee) one of its members made a commitment to do it. So if it is not accepted at one level, it is accepted at the other level.

MR. HAMILTON: Dr. Belliveau, it sounds as if your committee seems to function quite well in terms of monitoring of projects. What happens, or has there been a situation where there has actually been a regulatory action required against one of the parties, and if so, how was that handled? Is there a mechanism for handling that?

DR. BELLIVEAU: I've got to answer that yes and no. The reason is objectives are not legal entities by themselves. They are goals that both or all levels of government involved have committed themselves to. So you can't take action on anybody exceeding the objectives.

But what happens is that the moment the objectives are exceeded, it does necessitate some sort of action. And whatever jurisdiction it falls into, for example, the province of New Brunswick, that one of the industries was dumping something in that was causing exceedences in the particular objectives, then the province goes after them using some other methods.

The only thing this does is allow us to point to it.

MR. SHEWCHUK: How many site specific locations can you identify objectives for on the St. John?

DR. BELLIVEAU: On the St. John River, there is 68 miles of boundary water along the St. John itself, and then there are four rivers, tributaries, that cross a border. For the tributaries themselves we have set up one station at the border. The objectives have to be met there. Along the St. John, it is supposed to be met on the total length of the 68-mile stretch.

The ITAS has established a total of 13 control stations, we are going to call them. In other words, they are done every year. But there are a number of other stations that may also be done between these control stations or above, for example, in the States above the control station on one of the tributaries, or downstream from one of the tributaries on the Canadian side. These are also monitored, but not on a regular basis, and it could be any of the agencies that are doing it. But we definitely monitor a minimum of 13 stations that have been set as control points.

I am working on a report right now. I have a total of 212 stations for work that was done over a period of two years. A number of those stations, though, are so far in the head waters that we can't apply the objectives themselves; but it does give us an indication of what's coming downstream and will eventually reach the international portion.

MR. GODWIN: When you say; "done every year and monitored regularly", what do you mean? What is the frequency of monitoring?

DR. BELLIVEAU: It has varied. The minimum has been eight times a year at those stations. That's the minimum.

But in addition to that, for instance, we ran 24-hour pH studies. We ran two, three-week biological studies along the river. We had problems with dissolved oxygen and did cross-sections every mile, mile and a half for 30 miles downstream. In other words, data is coming in from these agencies on a number of studies; but the monitoring, ongoing monitoring is a minimum of eight times a year at the 13 stations. This monitoring is not necessarily carried out for all the parameters for which we have developed objectives. We have objectives for 17 parameters. But if we don't have any problems for two or three years, then we may only spot check that particular parameter. We will do other parameters where we know we have a problem.

MR. GODWIN: When you say eight times a year, what months are you talking about?

DR. BELLIVEAU: Every six weeks.

The other thing is, the approach that ITAS has taken is if we identify a problem, we monitor it for two years. We (ITAS), cannot do anything about a specific polluter. The parent committee can apply pressure on certain people or their members themselves. In New Brunswick it is the Deputy Minister of Environment, that is on the committee, so he has the

authority to be able to do something if it was a problem in New Brunswick. Once the problem has been identified, we will not monitor for it unless some action has been taken by management, and it has worked.

MR. FAST: I was just wondering about the public relations aspect of your exercise. Has there been any public relations or any public communications?

DR. BELLIVEAU: The majority of the public releases have been through the parent committee.

MR. FAST: So they would have some mechanism for informing people of what was taking place. Was there any public consultation in the establishment of the objectives or the numbers?

DR. BELLIVEAU: No. I just happen to have a book that was recently produced by the parent committee here.

MR. FAST: So that would be released --

DR. BELLIVEAU: They have different ways of releasing their information. They have press releases whenever they have a meeting, since they are fairly senior people, they have a press conference at that time. This book came out last year. It is the last information package to go to the public.

DR. THOMSON: This book, Paul, which is called Twelve Years of Progress, is that available from you if people write to you?

DR. BELLIVEAU: Yes, I think I have about 20 or 30 copies.

MR. GODWIN: What kind of turn-around-time do you get on those samples?

DR. BELLIVEAU: We do them ourselves in our own laboratory. The ones collected by the Water Quality Branch are analysed in the Water Quality Branch laboratory in Moncton. But the samples collected by state of Maine or EPA are anlysed in Maine DEP laboratory. The province does their own analysis and EPS does some of their analyses, but some of it is done by the province also.

Every parameter is different. I can't give you the answer to turn around time. I think it is one month maximum for all parameters. Some of them are as short as a week.

MS. CROSS: What sort of variability do you have in the methods used, and have you done a lot of interlab studies to determine the comparability of your data?

DR. BELLIVEAU: This laboratory was in existence before the Water Quality Branch National Laboratory in Burlington, and we have exactly the same methods. We have been on a quality control program, as we were when at

one time when there used to be water control laboratories right across Canada, and we are still operating the same way.

MS. CROSS: Do you compare your results with the American --

DR. BELLIVEAU: When we developed the objectives, along with the level that we have selected for a particular parameter, the method to be used to analyse for that thing was also established as well as the method used for comparing the data.

In other words, somebody this morning mentioned as an example, copper exceeding the guidelines which were developed based on the dissolved, whereas the analysis was done on extractable, and the difficulty comparison. This is all defined in the water quality objectives that were developed for the St. John. Analysis will be done using one particular method; for example, it could be the dissolved fraction, and the annual mean of a minimum of ten samples will be compared.

In the report that I am writing at the moment, one of the recommendations has to do with aluminum. When the objective for aluminum was originally developed, it was set at a particular level. We later found out that we had this problem with dissolved, extractable, and total aluminum. One of the first reports that came out stated that we were to use dissolved aluminum from then on. The Canadian method, or NAQUADAT method, went down to two orders of magnitude lower than the American method. One of

the recommendations was for the U.S. agencies to come up with another method which will be comparable to ours, or when doing this work along the St. John River, they should use our method.

DR. CAREY: I just want to add a couple of comments to the previous question.

The Ontario Region had a four-government study (the Ontario Environment, Canada, EPA and New York State Department of Environmental Conservation) on the Niagara River, and the methods there for trace organics differed so widely, that detection limits differed sometimes by three or four orders of magnitude. Somehow it worked out that for the first year of the study, Canadians were sampling the downstream end and the Americans were sampling the upstream end, and for some parameters, although we could tell at our detection that the Niagara River was essentially the only source of 99 per cent of the material, when you compared the results of the American at ten parts per billion and the Canadian one at two parts per trillion, the Niagara River was cleaning up by a substantial portion. It caused a lot of consternation at the time, but it pointed out the need for that type of quality control.

DR. HAFFNER: I think it is worth remembering the quality assurance program for toxic organics in the Great Lakes. The IJC developed a data quality work group, and through a round-robin process, tried to determine or develop a quality assurance program for toxic organics. The results were rather horrendous.

It almost appears that it is presently impossible to develop a quality assurance program for interlaboratory comparison of toxic data. The techniques are too variable. It is too much of an art as opposed to a science. This is why we have become menu-driven in terms of a monitoring program, there are only basic toxics or basic organics we can look at. When it comes to actually measuring what is there, we don't have the techniques or the expertise.

If we are going to address toxics on a broader scale, we are going to need different kinds of mechanisms. One for quality assurance, a second for data exchange. We are going to be dealing with very sensitive data. This is going to be the biggest problem of all. We are dealing with more than one agency and a very sensitive issue such as toxics.

If the data are not comparable, is your lab out of control or the other party's lab out of control? Who decides that? I think these are some of the more relevant problems we have to address, even more so than perhaps redesigning our monitoring program. We should be looking more at doing what we can do right now, and how to do it better.

DR. THOMSON: I think I would like to shift focus just slightly for a few seconds, to get back to the overall perspective of coordination and interagency, intergroup coordination. And looking at the western and northern regional contacts, specifically, it is my opinion, as I said earlier, that I think we have enough sort of mechanisms in order to

achieve what we want to achieve. We just have to decide which mechanisms we are going to choose and how we can get on with it.

For example, we have the Prairie Provinces Water Board, the Committee on Water Quality principally involved in interagency coordination. Unfortunately for the group that is assembled here, it leaves out the Northwest Territories. It leaves out interjurisdictional concerns between B.C. and Alberta, between Alberta and the Territories, both Territories.

We have the Canadian Counsel of Resource and Environment Ministers. We have seen one of the instances of something very concrete coming out of that group: in terms of the water quality guidelines exercise. That's why it has been mentioned so much today. Despite certain specific reservations in cautionary notes about that exercise, it has to be applauded in terms of interagency coordination.

These are ideas that I would like to run past you all, and in particular, I want to ask Don Fast his opinion, as a provincial participant, with regard to the CCREM mechanism, if he thinks it might be enhanced or accelerated a bit in the contact that we are talking today?

MR. FAST: All right, I think we have been very supportive of the CCREM directive, that there be national guidelines developed, and we're anxious to participate in that process because we can use the documentation and the information that is prepared.

Just in talking to some people this morning, I learned some new things about that process that I wasn't aware of, and I am supposedly on the task force steering this thing. This again demonstrates the importance of communication. If the process starts taking off in a direction that all of the participants aren't in agreement with or haven't been consulted on, I think the cooperation will be jeopardized, and there will be a bad experience in the end.

I am not sure I answered your question.

DR. THOMSON: Perhaps not, but I think you have provided an evaluative comment and something for us to think about because implicitly, what you are saying is the more bodies that get involved in something, the more chances there are for the overall target to be missed.

MR. FAST: Well communications are something you have to work at. A lot of effort has to go into the consultative process and meaningful input to pay more than lip service to that. It is really quite a time consuming effort, and I think the brunt of that is being placed on the shoulders of Environment Canada. They are doing most of the work, you know, and that's a credit to them. They are putting a lot of resources into it, but at the same time, they have quite a large responsibility to involve the other provinces and the other agencies and to make sure that when the process comes to an end, we are not all sitting around the table saying, well how did this happen, or where did this come from?

DR. TONES: I think that, after Environment Canada or the consultants take a first crack at even some of the parameters, they should perhaps go back to the task force with the question "Is this really what you want?" Sometimes, what you see after the first try is quite a bit different than expected, and may not, in fact, be giving you what you really wanted. Maybe that's what we are hearing now.

DR. THOMSON: In that particular situation, you see something coming back to you, and I must admit, speaking on the CCREM experience, that I am a bit in the same light as the provinces, in that I receive things coming down the tubes, and I am a little surprised sometimes in the format that they appear, or the content that's in it.

But on the other hand, because of the number of bodies involved, I tend to sit back and say, well somebody else must have decided that or it must be okay. Everybody else must have agreed, and then comparing notes, I realize it is no fault of anybody's, other than the fact that maybe we all haven't made enough effort to sit up and ask questions.

DR. TONES: It is only after you have tried to do something that you find out what you actually can do. What you can achieve may be different than the original mandate. For example, you may have a mandate to put Canadian content into basically American criteria, but when you actually try to do that, you may not find the relevant Canadian data. What you are going to send back is inferior to the guidelines the task force

expected. They should perhaps look at that again and say, make another decision.

DR. CAREY: Didn't the task force also request a list of research needs where data gaps were identified by the attempts to produce these data? Isn't that true?

MR. FAST: That's correct. That will fall out of the process, and we expect that there will be some gaps, and that in some cases, we will have either numbers that we're not totally comfortable with or maybe no numbers at all, and expect that there will be some research needs developed.

DR. CAREY: Well then what Pat says shouldn't necessarily alarm anybody. I just point out that these gaps really do exist.

MR. FAST: Yes, I don't think it would be unexpected to have some gaps, but the point she's making, if I understand correctly, is that there is that need for ongoing consultation, and you know, the task force has set out with some initial direction, and maybe now that the doers are carrying out that task, they are finding that they have to make some adjustments or go in different directions, and there now has to be some feedback to the initial task force for some further clarification or confirmation that things are being done the way they were originally invisaged.

DR. THOMSON: Does anybody else have any comments in connection with the more general topic of coordination and cooperation? How we are going to approach this in the future?

MR. McDONALD: My question is related primarily to research needs. It seems to me if you are identifying deficiencies, you better know what you are undertaking in the first place. And I was wondering if there is any mechanisms that the government or even the private sector can get access to what is going on?

DR. BELLIVEAU: Well if you want to find out what is happening at CCIW, they produce an annual glossary of research that is being conducted by each researcher that is there, and that's obtainable.

MR. McDONALD: How largely is that distributed? Does that go to all the provincial libraries, for example?

DR. THOMSON: I think the reason that I answered "no" is that, for example for our projects Western and Northern Inland Waters Directorate produces an annual report, as do other federal environmental agencies. All of their reports are distributed, but it could keep a person like you pretty busy walking from library to library to pick them up. And then to do a content analysis of it with regard to water quality objectives, you are going to come out with a pretty distorted and strange looking document in the end, or with regard to research, there is not only NWRI,

there is NHRI, then you want to talk to the various scientists involved, or you want to try and glean out some information how it relates to western context. It is going to take a while, and I would like to see something more coordinated in that direction.

DR. HAFFNER: Before we leave this, I would like to get a plug in for systems monitoring. With the Great Lakes, I think a major advantage was that both the monitoring and the research were focused on the same system, and a lot of exchange occurred on formal and informal levels.

I think it is really important that we try to find systems of federal and provincial concern, and then establish monitoring and research concerns, so that we can always work back to the systems themselves.

This morning somebody talked about basing our programs on river basins or on the watersheds themselves. I don't know who made that comment, but I think that type of approach is essential. I think once we start working on the same ecosystem or same river basin, then I think relevant data exchanges and technological exchanges start occurring.

Another topic of coordination we haven't talked about today, is the expertise in terms of sciences or technical abilities which are associated with an assessment program.

DR. CARLISLE: I think we are being a bit cynical in saying that the data

are not available, from research at any rate. We are dealing with two really rather separate data bases. One, the data bases resulting from monitoring, which for the most part are available through NAQUADAT or various computerized data bases within the provinces. These are reasonably accessible to anybody.

Of the more fundamental scientific research, which I think is what we are talking about, you should remember that part of the duties of any research scientist is to publish his research in the general scientific literature. Although that may be with a slight delay, it is always accessible through the Canadian Institute of Scientific and Technical Information, computerized data base. It may be not necessarily in the form of the raw data, but if it is particularly interesting, if a research paper is sufficiently interesting to you that you need the data, then you have access to it by writing to the individual author.

I think in general, the information is available if you are prepared to dig for it, and the digging is not really that difficult through the data basis available.

DR. THOMSON: I want to speak to both points you have made. First with the data basis and the available data, and I agree with you completely that we can access NAQUADAT, we can write to the provincial agencies if not on NAQUADAT, but what do the data mean? A lot of us here are not familiar with the situations that we are looking at. We need

interpretive data, and that doesn't exist in a lot of cases, in the majority of cases, with the Water Quality Branch.

For years, we have been collecting data, we rank right up there with the best of data collectors, but what do we do with it, that's the one point. It is out of context, and we are aiming towards trying to correct by looking at a system orientation. But the second thing in terms of scientific research, I don't want to speak for Rodger McDonald, but if I was asking the question, I would say, how do we know about ongoing scientific research? How can we help direct it? How can we get at the answered questions, and then when the papers are ready, how do we know about the papers?

You have pointed out one way of doing it, but let's look at ways of facilitating it, too. Let's look at ways of doing it whether it is through the Committee on Water Quality, the PCWB secretariat or CCREM or through whoever. Let's agree not to closet all our ideas and hold them back.

DR. CARLISLE: I suspect we are at opposite poles here, but I contend that the data is available, but with a fairly minimal delay. Maybe it is not all interpreted. Maybe as far as the monitoring is concerned, it has not been interpreted but then the people who want it, if they are in government laboratories, federal or provincial, or a private consultant or in universities, if they want it, they should know enough about the system to be able to do interpretation themselves.

It is not an ideal situation, and as far as the up-to-dateness of the information is concerned for the research, at least as far as the NWRI and NHRI are concerned, then the regular publication of what is going on is freely available. They are certainly widely distributed. Anybody who wants one can ask for one, those detailed programs going on, and then it is up to anybody to get in touch with the individual researchers.

There are relatively few researchers in this country in anything to do with water, compared with the U.S.A. It is not that difficult.

DR. THOMSON: Maybe we are getting slightly off track, but I would like to give one example. One of our prime data users in western Canada is Parks Canada. Every year we give them a nicely bound report of numbers, and every year they put it up on the shelf. They might get back to us and ask us what does this mass of numbers that you gave us tell us.

We have to look at ways of improving the delivery of those numbers and making them meaningful to the users, and right now Parks Canada, who are the managers, do not have access to the data in any sort of usable form. And that's the sort of thing I am talking about. I don't think you and I are at such opposite poles, but I think it is a process of refinement when it gets down to the specific users and recognizing the needs of those specific users.

MR. McKERNAN: I would like to respond, just to confirm what Ken Thomson

is saying. Perhaps Manitoba is in a slightly different situation because we have a strange legal instrument there pertaining to hydroelectric development effects. But there is, in fact, a lawsuit right now against, among others, Canada, that alleges that monitoring of ecological effects of previous development simply didn't occur. And the reason, in our view, that this lawsuit names Canada isn't because of the absence of effort on the one hand, or intent to do monitoring on the other. It is simply because the efforts at interpretation weren't commensurate with data gathering, and the results didn't get disseminated. What doesn't get disseminated goes out, as you say, in the professional journals, in the professional trades, and among that small community of people. However, there are far more individuals than we who are interested in these questions and monitoring results, and they are less technically literate, less computer literate, less at ease, less knowledgeable about how to get information. And the perception, in my view, is what led to the lawsuit.

DR. CARLISLE: You could well be right. In fact one of my main beefs against NWRI is that it is far too much a data gathering -- rather than a data reduction, which is what a true research institute should be.

But as far as the data are concerned, which was the initial question, I think the data are generally available, but you have to have someone educated in the area to be able to make any use. There, really, is where we are falling down. We are failing to interpret the data for the general public, or even to reduce the data for other scientists.

DR. HAFFNER: What do you mean by use, though? It seems to me that for long-term trend or water quality objectives or environmental impact assessments there are definite design rationales. To make use of the data for a reason that the program wasn't designed for, tends to be one of the greatest problems we have. The data are misused. We can spend a long time trying to correct a situation like that, which slows our interpretation procedures to a halt.

This is the trouble of just pulling data off a file, you don't really know why that data was collected, why it was collected in that fashion, and what right you have to use it in the ways you might wish to use it. Whenever you pull data off a file, is there any sort of caveat with it stating the rationale or design behind this data file you now have? You often don't get that. What you get is simply a long series of numbers.

To be honest with you, I would hate to try and interpret much of the data which are in the data bank. That's why you always have to go back to the aquatic system of concern again. What kind of design was set up on that system? What was it trying to achieve? What were the issues that were being addressed? And once you know that, then the data base becomes relevant. But until you have that up front information, there is an uncoupling between design and interpretation and, of course, a resultant lag in interpretation.

DR. CARLISLE: It also lagged behind because of the threat of lawsuits.

So after that kind of experience, you wonder that we cease to interpret and choose to give them the raw data instead.

DR. HAFFNER: Well that occurs. I think the dioxin issue is a good example of that. We found a source of dioxin on a river in Michigan with a monitoring program involving four agencies, Fish and Wildlife Service, Environment Ontario and the Canada Wildlife Service found dioxin, but the Michigan Department of Natural Resources couldn't find dioxin.

The important thing was the coordination. When three agencies found dioxin, there was no longer the matter of yes or no, or my opinion versus your opinion. I think this is where the coordination aspect does come in, providing a verification perspective.

MR. ALLISON: I guess I would like to suggest that interpretation and problem identification is hindered by interjurisdictional nature of water. For example, let's ask the question, who should do data interpretation and problem identification in Canada?

Let's use Lake Diefenbaker as an example. If the federal government does interpretation, and it ends up identifying a problem, what they have done is identified a problem and turned it over to the agency which has the responsibility and mandate for managing that water.

So on the federal side, it is fraught with a lot of difficulties, and on

the provincial side, as I understand it, it seems to me to be fraught with a lack of manpower, inability to fund this kind of interpretation.

MR. FAST: Well it is funny you should mention Lake Diefenbaker. That is one area that we have had a cooperative study with Environment Canada for the past year. I realize there are some risks involved in undertaking a study of that nature because if some problems are identified, it could become sensationalized or very controversial. But I think we have enjoyed quite a good working relationship to this point, anyway. We have felt that we have really benefited from the joint study, in that we just didn't have the resources provincially to take on the size of study that was required.

By doing a cooperative study and pooling our resources, I think we have been able to get a much better field program, a much broader data base, and we are now in the stage where we are working on the report. We have yet to go through the report and the public release and all of the stuff that goes after that, but I think we have certainly started in the right direction. We have worked very well together so far.

As a matter of fact, we are encouraging their participation in another study on the Saskatchewan River. So we are more than satisfied with what has taken place so far on Lake Diefenbaker.

MR. ALLISON: Perhaps I would ask you to comment in the light of the Tobin Lake experience.

MR. PAST: Well the Tobin Lake experience was one that was not quite as positive from my point of view. I still get cards and letters from that area asking me about baby malformations, and that sort of thing. That is an example of sensationalized reporting and how perhaps good technical information can get blown out of proportion in the media.

You have to recognize these problems at the outset, I think, and proceed with some caution. You are dealing with the public out there, who don't understand all of the technical terms, and they don't understand the implications.

When you, as an expert, identify things that cause cancer or cause enormous health effects and you can't answer their questions about the potential impact on the people living there, you have a real problem.

In the last few years, our lab capability has certainly far exceeded our ability to understand and interpret the data. That's one of the reasons we get into problems as we did at Tobin Lake.

MR. ALLISON: So what you are saying is that the way to go at this is joint federal-provincial studies?

MR. PAST: Somebody else raised this water quality agreement thing. The federal agencies have been contacting the provinces about that.

I think those agreements afford an opportunity to set a framework for cooperation. I am disappointed in the approach that is being taken in that they seem to look at formalizing exchange of routine data collection. I think that's really missing the mark on what these agreements could achieve, and I would like to see a much broader agreement. Looking at things like interlaboratory quality control, projects of common interest, as well as the data exchange and the monitoring efforts.

Once you have an agreement in place that provides a framework or an umbrella, it gives the technical people something to operate under. It sort of sets the senior people and the politicians at ease that there has been consultation and things are on some kind of a track. I think there is some opportunity for improved cooperation through the agreements.

DR. HAFFNER: I would like to echo that sentiment. I think agreements are more than just being data exchange from routine work. I think the important thing is not so much the signed piece of paper which makes the agreement work, but the committees that work under the agreement that really make it go.

I think that's what we are really about. Together we can do comprehensive assessments, comprehensive assessments within river basins, sharing resources and expertise, because neither one of us can do it alone.

MR. FAST: And that's where the trust and the careful handling of things can be developed. If we have too many more experiences like Tobin Lake, there won't be a lot of cooperative effort in the future. You just can't afford it. It hurt both agencies. At this point, there is no use laying fault. I am not sure you can even figure it out. It is just something that happened that wasn't a happy experience.

DR. WAITE: Partly a comment on Don's comment, partly I guess a comment on the question that was raised about interpretation of data: When one works with environmental toxicology doing so-called research or surveillance, you quite frequently find things that can be alarming. You find chemicals that are not supposed to be wherever you find them, and they represent potential threats. The only problem is that when you go back to the literature, you find that you can't interpret the concentration. What do you do with the data? You have got to discuss the data with colleagues to come up with an interpretation. You have to interpret it in some way, and you are either left with public divulgence.

I am on the federal side now, and I am not in the position I was when I was working for you. But what would be your suggestion in terms of a rational approach to something like the North Saskatchewan or the South Saskatchewan study, where you are looking at upstream agricultural municipal industrial complexes, and trying to gather background information on chemicals that are generated by human use and then trying to amass enough background information to get an interpretation over the

course of five or ten years that is required? How do you handle the data so that you can talk about it and yet not alarm people?

MR. FAST: Well I am not sure there is an answer to that question. We have a budget analyst who keeps asking me why do you want to do that? It is just going to find new problems. Why don't you work on the ones you already have? It is a difficult question to answer.

Maybe we have spent too much time exploring new areas and not enough time addressing the problems we already have and that are well documented. Maybe we should be putting more effort into that. Saskatchewan, for example, has a problem of eutrophication of surface water, and by and large, not a good deal of federal effort over the years has gone towards solving that problem.

I was amused about the discussion of research efforts. We used to get this show from Burlington every year or so where these people would come to Regina and listen to the provincial research needs, and then we wouldn't hear from them again until the next show two years later.

After two or three go rounds of that, you get tired of the process. You just don't want to participate anymore because there is nothing in return.

DR. THOMSON: Well this is really the same comment that Dennis Gregor made earlier, and Water Quality Branch has some empathy with the provinces in this regard because we were subject to the same routine.

DR. WAITE: To talk about research aspects of water, I find one of the problems is that everyone is reticent to talk about the work that they are doing. For example, standard water quality monitoring and surveillance collects all kinds of interesting information. People don't, however, want to stand up and talk about what they are doing and pass that information along.

When people do call a halt to the field work and spend time at their desk trying to write up and interpret the data, the research managers react as if the programs have ground to a halt. The scientists are not going out and doing things in the environment. So you don't get the interpretation that allows you to stand up and communicate.

That is a quandary we are caught in. You always have to be out in the field doing something or collecting something and amassing great lumps of data, but there is absolutely no impetus to getting it interpreted, written up, and then published in a form that other people can assimilate and incorporate into their own programs.

And I guess that is more laboratory, your laboratory flowing along the same line, but we have people who are managing around here in the room. We have people who are looking in terms of objectives and interpretation of data, but I don't see any plan or any attempt to try and utilize our existing data and to force the people who are collecting it and who have the field experience to get involved in the interpretation and dissemination of the conclusions that have been published.

DR. THOMSON: I think that's a worthwhile point. So how are we going to do it? How are we going to overcome it?

DR. WAITE: You have to be able to do both, though. You can't expect one group of people to sit in the office all day long and do nothing but interpret data and then another group to go out and collect bottles of water and no communications between the two. You have to have people who can go out and get the data and appraise the field situation, and if necessary, go into the laboratory and get involved in that process and interpret.

And it seems to me that in the federal government, at least, once you raise above a certain rank, you are not expected to leave your desk anymore. If you get above a certain level, you are suddenly too expensive to go out into the field. They want you to sit and pass paper across your desk. They don't want you to go out and actually attack a problem, interpret it, and attempt to solve it.

DR. THOMSON: I think to add to what you're saying Don, also there should not be as specific a distinction made between field work and office work.

Often it is set out that in year one, we will collect great amount of data, and year two we will sit in the office and interpret it. There is such a thing as collecting data and learning from collecting the data. There is such a thing as cooperating in the field and learning and

gathering information and disseminating information while you are doing that.

And it is not only restricted to the field acquisition of data, but it also includes the negotiation, the types of things that the Committee on Water Quality does, the work groups that the water quality community has. Things are learned from that and gained from that, but how can we accelerate it? How can we trade information and enhance that? How can I sit down with Dwight Williamson from Manitoba and plan a study that will benefit us both, but have broader application to the rest of you? These are the sorts of things that in the future, I would like to see us work toward, and I am just sort of serving notice of that.

I can see that we have reached another exiciting point here, because it is really a bit of an unanswerable question, and nobody has really taken a stab at the existing mechanisms, commenting on them.

And I think what I will do, is put my friend from Alberta, Paul Shewchuk on the spot. And I would just like to see if we could benefit from a few comments on his experience with the Committee on Water Quality, and what he feels its successes have been.

MR. SHEWCHUK: There has been enough technical evidence arrived at in setting site specific numbers, and I think the ramifications or the implications are things that we are going to have to look at.

There are a couple of indicators that require further evaluation, i.e., major ions such as potassium in these river systems, and whether there is equitableness that is truly equal to Alberta and Saskatchewan and Manitoba.

Those matters haven't been resolved as yet. The approaches to standards that have been established over the years have changed. There has been a lot of variation in terms of technical approach. And we still have to assess whether they are fair or not.

There has been a change in committee personnel over the years. It has been an accomplishment to arrive at finalization of those numbers. And I think we still have to reserve our comments on the successes until senior management is assured of the reasonableness of these numbers.

It's worked out quite well, I think, Ken.

DR. THOMSON: You are also involved in Mackenzie River basin, specifically on the Alberta-Northwest Territories bilateral negotiations. Would you see the Committee on Water Quality perhaps being a good model for interjurisdictional relations with the Territories?

MR. SHEWCHUK: Well, it will be one approach. I think all we have done to this point is basically look at the historical data. There has been perhaps some imperfections or flaws in the data set, and that has to be re-evaluated.

What we are into right now is a holding pattern until the rationale documents become completely finalized at the PPWB boundary stations. They may become the basis for establishing so-called indicators for the monitoring stations of the Alberta and Northwest Territories boundary.

But there will probably be some reservation as to the application of the approach for those boundary stations, until we have some concurrence with the province of B.C. in respect of upstream Peace River flows. In other words, if we are going to have an equitable approach at the Alberta-Saskatchewan station, it should apply to the Northwest Territories and Alberta. There should be some equivalency for B.C. and Alberta, particularly at the Dunvegan site on the Peace River.

We are kind of caught right in the middle. We are both the downstream province as well as the upstream province in relation to Saskatchewan and the Northwest Territories. So I think we have to look at the entire spectrum of what that entails for Alberta.

DR. HAFFNER: Is there a need for a Canadian Water Quality Conference of some sort, where federal and provincial ideas and findings are exchanged? Is something like this useful?

I find it strange working on these agreements. I am always surprised as to what has gone on in each province, what expertise is in the province. I often go there wondering, 'do they really have a network?' Then I find

they often have a good network, they all have extremely valuable expertise, good data, and face some of the problems you were referring to earlier, but it is taking a formal negotiation process to integrate these things.

DR. THOMSON: We have three gentlemen up here who have been involved in working at this problem and wrestling with this problem, in often cases, very formal respects, from a very formal perspective. It has taken specific sort of issue-driven initiatives in order for them to work toward addressing the problems. But do we need a crisis to react to? Do we need an issue to react to, or can we be, to use jargon, pro-active, to start to anticipate some of these to reimpact them in the long run?

MR. FAST: I guess one hope that we have for all of these task force, federal task force committees that are around these days is there will be some clarification of roles. I think one hindrance there has been in the past to cooperative efforts, is a lack of understanding of what the federal and the provincial roles are. And as long as I as a provincial manager perceive federal people intruding into my area of responsibility and generating grief for me, it is going to be difficult to have good cooperation.

Again, one of the things I mentioned earlier was this opportunity for meaningful input. I sometimes over the years have gotten the feeling that no matter how hard I talk and suggest areas where federal people

could be involved, they don't listen but rather they do the exact things I don't want them involved in.

I suppose you see it from the other point of view, that the provincial people don't listen. The clarification of what our roles and responsibilities are, is important.

DR. THOMSON: I guess one thing today has shown is that there is no easy answer, although I didn't expect that there would be.

But how do people feel about working in small groups on some specific issue, for example? I am a little at a loss to give an example right now, but I see people from Fisheries and Oceans. I see people here from the Northwest Territories, from fellow groups of Environment Canada, from the three provinces.

In my brief experience with the PPWB Committee on Water Quality, we made a bit more progress when we were in small working groups, instead of a large group here today or the larger committee. It seems to have proved profitable, and that's no disrespect to the larger committee either. It is just less people that are peripherally involved.

MR. GODWIN: I think the Prairie Provinces Water Board Committee on Water Quality is an organization that has worked over the years and is making progress. In the fall of 1986, we will have site specific water quality

indicators at all of our eleven sites. We will also have a report on laboratory coordination between Burlington and the prairie labs to insure that we are all talking about the same relative numbers when we define each parameter. These type of things are working, and they are working, in my opinion, because we are trying to operate in that committee in the way that Don Fast talked about at the start of this portion of the seminar. He listed three do's and three don'ts, and he added, in his words a few minutes ago, an important additional one - Clarification of the Proper Roles.

In our roles, when we talk between federal and provincial agencies we should realize that the water resource belongs to the province. The provinces decide what they are going to do with it, and the federal people help them, but the Federal Government should never usurp the role of the province in providing that help.

It is because we have tried to maintain that role, that we have been successful in the Committee on Water Quality. I hope the federal agency representatives that are here today will listen to that idea and think about it.

DR. THOMSON: That's well put, Bruce.

DR. HAFFNER: I think, actually, you will find this idea of role resolved in the federal-provincial quality agreements. The very first paragraphs

of these agreements, defines the Canadian responsibility and the provincial responsibility exactly as you have just described it.

The essential aspect of an agreement is that we recognize a common need for information. I think it is commonly recognized by everyone in this room that for a lot of the federal data to be usable, it has to be available and needed by the provincial agency. They are the managers. The data has to be useful to the province and the federal government, and that's what the agreements must provide.

MR. GODWIN: I understand what you're saying. I am talking about the elements of trust. I am talking about "leaning over backwards" to ensure that you continue to help, and that you don't get overly anxious when you get close to an answer. Make sure that all parties agree by taking that extra month or so, by talking to them, and by making sure that you respect what the province wants to do, as much as you respect what Environment Canada want to do. After all, we are all working towards the same ultimate goal, and when we don't include everyone, some of us don't get there.

DR. HAFFNER: It's a big thing. I think trust has to start on a small basis, and I think that is what we are doing here now is developing this trust. This is possibly why we can't find some solutions today to some of the questions. Trust has to grow before you can have the conversations required.

MR. GODWIN: I can't resist having one additional word.

There is another reason why we can't find an answer today. The questions we are asking ourselves, such as who's going to provide the money or why can't we do this research, are not our responsibility. Our bosses, or their bosses, or someone with more authority than them in the political or ministerial end of the government has to realize, "By God, you've really got a problem there. We better put some money into it".

Until those decision makers reach that point, we can talk ourselves blue in the face. We can talk about the need for additional people, research or anything else, but it will have no effect.

DR. THOMSON: I think implicitly, at least, Mr. Godwin has hit on a few of the sentiments that I have. For all I have been bringing you people to task for not offering any solutions, I was really not expecting any solutions. I was hoping some questions would be responded to today that we could think about in the future days and future weeks, and maybe by the time you get the transcript of these proceedings, you will be able to get back to me to suggest ways that we should go. Ways that we should enhance or accelerate information sharing. And really what I am doing here is suggesting that one avenue, and only one avenue of coordination could be through my office.

I am willing to act as a vehicle to exchange information and will attempt

to provide all of you with information when and if the opportunity arises and if you are willing. I don't want to inflict my office or my people upon you.

We as federal agency, strange as it may sound to some of you, do have more than enough work to go around, but we look at one of our roles as assisting in the coordination of information throughout the region.

I think, unless there is any further questions, I would thank the panel for a job well done late in the afternoon, and ask Bob Ruggles to make some final comments.

MR. RUGGLES: It says here on the end of the agenda that I am supposed to draw conclusions. Well, I am not going to even try to do that. I really don't know what we concluded as far as what data is needed, and I really don't know what we concluded in terms of research.

Maybe it would have been better to sit down for an hour and brainstorm on things like research needs and put a whole list of things on the blackboard and record those, to give at least participants a chance to think about them, and then maybe people like Ken and I have a chance to organize another get together like this on specific topics. Perhaps Ken's idea to address specific issues is the way to go. Maybe we did that, but I will have to read the transcript.

I certainly appreciated the comments coming out of the last session. I will draw a couple of personal conclusions. One is I am a little bit afraid of too many committees. I think management by committee tends to not work. Maybe a dictatorship is the best way to do things, if you can find the right dictator, but management by committee, I think is a little scary.

One other thing that kind of bothers me is we may end up with too many objectives, and I will speak from a Saskatchewan point of view. We have a national effort going on to develop national guidelines or objectives. We have Prairie Provinces Water Board producing objectives. We have our own provincial objectives. There are objectives at the international boundaries, and God knows, there may be objectives at the Territorial boundary of Saskatchewan. It's a little scary, and it is not anything yet because we may get objectives, watershed by watershed, or river system by river system, and I don't know how a small group of five or six people is going to handle all that in the province of Saskatchewan.

I do notice, looking at the list of attendees, that at least 50 percent of the people here are with the federal government, and the question was asked, where are the researchers? Well, if we just go by percentage attendance, there has to be a lot of researchers available in the federal government. They are certainly not in the province.

With that, I would like to thank Ken very much for asking me to

participate with him in developing this workshop. I have certainly enjoyed it, and certainly am very pleased with the attendance from almost every province, even though it's a western oriented workshop.

(Workshop adjourned at 4:15 p.m.).

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